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3. **Bind across top edge**

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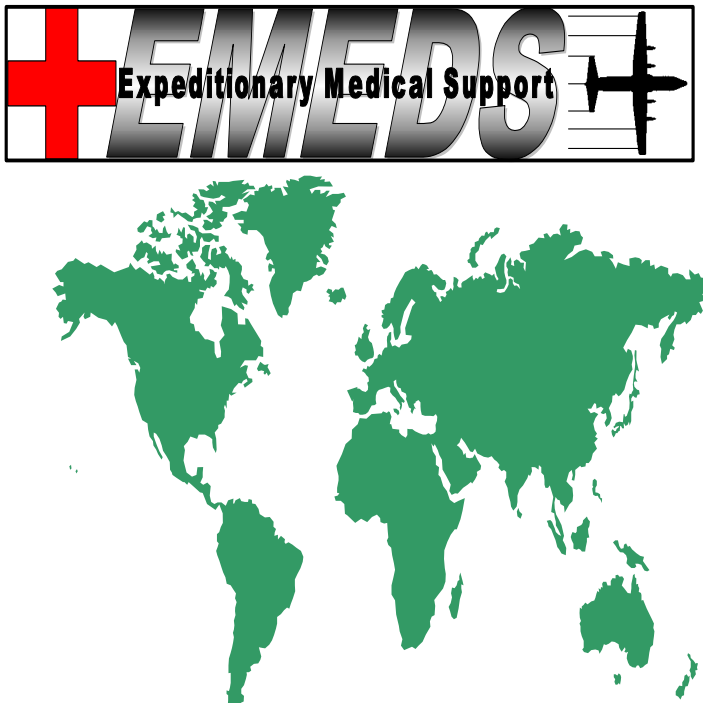

Small Portable Expeditionary Aeromedical Rapid Response

EMEDS REFERENCE HANDBOOK

US Air Force School of Aerospace Medicine

For Training Use Only

Expeditionary Medical Support
EMEDS
SPEARR
Small Portable Expeditionary Aeromedical Rapid Response
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CHAPTER 1
INTRODUCTION

An Aerospace Expeditionary Force (AEF) is an organizational structure of force capability packages that provide warfighting CINCs with rapid and responsive aerospace power. These force packages, together with their support and command and control (C2) elements are tailored to meet specific needs across the spectrum of response options and will deploy within and Aerospace Expeditionary Task Force (AETF) as aerospace expeditionary wings (AEWs), groups (AEGs), or squadrons (AESs).

The Air Force Medical Service (AFMS) must be ready and capable of providing required medical support to the warfighters no matter the scenario. Potential deployments include the full spectrum of deployed contingencies. Doctrinally, the AFMS will provide a tiered and tailored medical capability that is driven by mission, threat scenario, airlift availability, and population at risk. The concept is to flow essential medical capability in on the first aircraft. As the operation expands, and as airlift becomes available, additional medical capability is brought in.

This employment process begins with an initial force package known as the Squadron Medical Element (SME) progressing to the fully developed Air Force Theater Hospital (AFTH) where significant specialty care capability and intensive care will be available. These capabilities will be utilized to provide essential care, deferring definitive care to the continental United States (CONUS) or supporting theaters.

Figure 1 illustrates how we envision the military situation unfolding. The red-wedge ramp-up phase corresponds with contingency deployment and build-up activities. It is during this period that military forces are at high risk for food/water/sanitation, DNBI, injury, industrial or occupational accidents, and terrorist attacks.

The SMEs and IDMTs may deploy with their assigned squadrons. If deployed, they may be the fiest medics on the ground and the most forward deployed with or without their air transportable clinic (ATC).

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Medical Global Reach Laydown (MGRL) teams will deploy with air mobility forces (e.g., tanker airlift control elements [TALCEs]) in the early stages of a campaign to establish the air bridge and aerial ports of delivery in theater. These assets usually deploy in advance of deployment forces and are normally withdrawn after deployed medical infrastructure is in place.

Aerospace Medical Contingency Ground Support System compontnts, which includes Expeditionary Medical Support (EMEDS), deploy in various combinations to support a specific theater/regional population size, deployment scenario, and casualty rate (combat, disease and nonbattle injury [DNBI], and other). Personnel and equipment packages may be tailored, replicated, or combined with previously deployed UTCs to reach the desired capability effect. Additional EMEDS/AFTH increments are deployed based on the CINC requirements.

The ramp down phase typifies contingency redeployment activities. Redeployment of medical capability is expected to mirror the shrinking military presence, taking into account the threat scenario and the population at risk.

AEROSPACE MEDICAL CONTINGENCY GROUND SUPPORT SYSTEM

The Aerospace Medical Contingency Ground Support System represents the cornerstone of medical support to AEF forces deployed in any worldwide contingency. The mission of the AFMS Aerospace Ground Support System is to rapidly deploy and provide forward stabilization, primary care, dental services, force health protection and to prepare for aeromedical evacuation of aerospace expeditionary forces or civilian casualties, as appropriate. This system optimizes warfighter performance by delivering essential care with minimal cost in terms of weight, cube, lift and forward footprint.

The medical capability required at each bed-down location is determined by expected casualty rates, casualty types, population at risk (PAR), evacuation policy, evacuation delay and evacuation distances. Geographical positioning of medical capability, which minimizes the time from point of injury to treatment, is essential. Medical planners must specifically consider requirements for the following when determining the proper medical support configuration for each bed-down location: emergency room, inpatient beds, operating room tables, intensive care beds, primary care, mental health, dental care, and patient transportation requirements. Each of these factors varies, sometimes driving requirements based on projected casualty rates. Additionally, deployed medical facilities normally do not provide reconstructive surgery or rehabilitative services unless supporting a multinational force or humanitarian operation.

EXPEDITIONARY MEDICAL SUPPORT (EMEDS)

The role of EMEDS, as part of the AFTH, is to provide individual bed-down and theater-level medical services for deployed forces or select population groups within the entire spectrum of military operations. EMEDS are modular packages, tailored to meet theater commander in chief (CINC) requirements, by providing a flexible theater hospitalization capability. The EMEDS is divided into three increments: EMEDS Basic, EMEDS +10 Bed and EMEDS +25 Bed.

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EMEDS Basic: EMEDS Basic provides the operational medical support required to provide medical care in a myriad of operations with a PAR of 1-2000. EMEDS Basic provides Level 2 (Casualty Collection and Forward Resuscitative Surgery) capability. Specifically, it provides forward stabilization, primary care, dental services, force health protection, and prepares patients for aeromedical evacuation. EMEDS Basic has four holding beds. Definitive medical/dental care is deferred to CONUS or supporting theaters. EMEDS Basic deploys with 7 days of supplies. Additional supply pallet UTCs can be deployed simultaneously or as needed to fit CINC operational requirements. Equipment can be prepositioned or incrementally deployed. EMEDS Basic is currently comprised of two modules.

- **Module 1: Small Portable Expeditionary Aeromedical Rapid Response (SPEARR) team.** The leading edge of the EMEDS Basic is the SPEARR team. The SPEARR team fits the definition of Level 2 (Casualty Collection and Forward Resuscitative Surgery) health service support (HSS) capability. The SPEARR team provides a rapid response, extremely mobile, forward resuscitative, preventive medicine and environmental health medical capability. The team is deployable in two modes, completely man-portable or with a sling loadable (one pallet equivalent) trailer. **Supplies and equipment are extremely limited.**

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Sufficient and timely coordination with the PMRC, including medical supply and equipment requirements, is essential to ensure smooth patient movement.

Remember EMEDS equipment is not approved for in-flight use and must not be place aboard the aircraft.

- **Module 2:** Module 2 consists of the remaining 15 medical personnel, supplies, and infrastructure currently packed on two 463L aircraft pallets.

EMEDS Basic must be supported by Expeditionary Combat Support (ECS) to be fully functional. This support includes: appropriate vehicle of opportunity that can be converted to patient transport vehicle (the EMEDS allowance standard [AS] includes supplies and equipment to modify the vehicle of opportunity); a 10K forklift; transportation to move [two 463L] pallets from airfield to field site; and an appropriate vehicle capable of towing a 6,000-pound trailer. The sling loadable EMEDS Basic trailer is equipped with both military and commercial style hitches.

Both EMEDS +10 and +25 bed provides a Level 3 (Theater Hospital) HSS capability. These enhanced clinical capabilities are historically found in a medical treatment facility (MTF) located in a lower-level threat environment. These AFTHs are staffed and equipped to provide a high level of resuscitation, initial wound surgery, and post-operative treatment. This level of care is the first step toward restoration of functional health, as compared to procedures that stabilize a condition to prolong life.

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EMEDS +10: EMEDS +10 provides medical/dental care in a myriad of operations with a PAR of 2000 – 3000. Included in this capability are 10 inpatient beds. EMEDS +10 deploys with 7 days of supplies. Equipment is either prepositioned or incrementally deployed. Additional supply pallet UTCs can be deployed simultaneously or as needed to fit CINC operational requirements.

EMEDS +25: EMEDS +25 provides medical/dental care in a myriad of operations with a PAR of 3000 – 5000. Included in this capability are 25 inpatient beds (cumulative). EMEDS +25 deploys with 7 days of supplies. Additional supply pallet UTCs can be deployed simultaneously or as needed to fit CINC operational requirements. Equipment is either prepositioned or incrementally deployed.

Patient Movement: Expeditionary battlefield philosophies have driven significant changes in medical support including minimized forward medical footprint, evacuation and replacement of patients, and transporting stabilized verses stable patients. The requirement to move patients is a joint responsibility and in today's environment, is even more critical to the health support system. Patient evacuation can be by surface (land or water) or by air (rotary-wing, tilt-wing, or fixed-wing aircraft); however, air is preferred.

Several components of the Aerospace Medical Contingency Ground Support System can only provide essential care in theater. Thus, timely and rapid patient movement support is critical to mission success. For additional patient movement doctrine, reference Joint Publication 4-02.2, JTTP for Patient Movement in Joint Operations.

Patient Movement Coordination. The patient movement process begins when a health care unit sends a request to the servicing Patient Movement Requirements Center (PMRC). The PMRC evaluates the request, validates the requirement (addressing medical, operational, and administrative issues required to safely move a patient), identifies a potential destination(s), determines the mode of transportation, and assigns patient and equipment requirements to the appropriate Service transportation component. Patient movement bay be executed using rotary-wing, tilt-wing, ships or fixed-wing assets.

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Air Force Theater Hospital: Fixed, mature AFTH facilities in supporting theaters receive patients from deployed medical facilities where essential medical/dental care has been rendered. Mature AFTHs are defined as having a complete set of capabilities represented by specialty UTCs as well as deployable medical teams with their corresponding UTCs. These mature AFTHs provide a robust capability much different that a 50-bed AFTH with no augmentation UTCs.

Chemical and Biological Threat: Until collective protection for the EMEDS portion of the AFTH system is fielded, the EMEDS CONOPS assumes it will operate in a low chemical and biological warfare (CBW) threat environment. Personnel required to staff decontamination (DECON) teams, patient retrieval teams, and biological assessment teams are not embedded in the EMEDS personnel matrix. Higher threat scenarios will require additional specialized medical equipment as well as specially trained and equipped personnel. Base support will be required for decontamination of the EMEDS prior to, and after operational use to include decontamination of the site location when necessary.

SECURITY. Medical personnel and equipment are non-combatant assets. Medical personnel are authorized arms IAW AFI 31-207, *Arming and Use of Force by Air Force Personnel.* Security within the immediate area for patients and personnel at each deployed medical site, with the exception of enemy prisoner of war (EPW) patients, is a medical responsibility. As at CONUS based facilities, medical site assets such as narcotics, are protected as a controlled area in accordance with AFI 31-209, *The Air Force Resource Protection Program.* Additional Force Protection measures should be determined by the EMEDS/AFTH commander based upon THREATCON and the advice of the Defense Force Commander (DFC).

LOGISTICS. Medical logistics personnel in concert with line and medical planners provide insight into when, where, what, how much, at what rate, and for how long War Reserve Materiel (WRM) is required. This knowledge formulates essential strategies that ensure adequate EMEDS/AFTH materiel is pre-positioned, available at the deployed location, or deployed with personnel. EMEDS/AFTH increments initially contain seven days of supplies. A limited item 10-day re-supply package is available as either a “push” or “pull” asset.

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Chapter 2 Expeditionary Combat Support

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ITEM	EMEDS Basic (I)	EMEDS+10 (II)	EMEDS+25 (III)
Site Prep	15,000 ft^2	26,000 ft^2	40,000 ft^2
Work Shelter	100sq ft/1st 24 Hrs; Then 1950 sq ft	3900 sq ft	5850 sq ft
Billeting	25 people	56 people	86 people
Latrine/Showers	29 people	66 people	111 people
Foodservice			
Regular	87 meals/day	198 meals/day	337 meals/day
Liquid	3 meals/day	9 meals/day	12 meals/day
Laundry	1,000 lb/wk	2,000 lb/wk	3,600 lb/wk
Vehicle Maintenance	TBD	TBD	TBD
Power	65kW ECS	100kW ECS	200kW ECS
POL			
Diesel	0	150gal/day	300gal/day
	400gal/day	800 gal/day	1430 gal/day
Ice	0	85 lb/day	150 lb/day
Waste			
Medical Waste			
Liquid	700 gal/day	1400 gal/day	2500 gal/day
Solid	180 lb/day	610 lb/day	1100 lb/day
Communications			
Phone	9 (4 cell, 3 land, 2 crash)	10 (4 cell, 4 land, 2 crash)	12 (4 cell, 6 land, 2 crash)
Satellite/Tele Medicine	1	1	1
Land Mobile Radio (LMR)	8	8	8
STU III	1	1	1
Oxygen (LOX)	40L/day	60 L/day	90 L/day
ECU Units	3	6	9
Pallets	3	13	26

ITEM	EMEDS Basic (I)	EMEDS+10 (II)	EMEDS+25 (III)
Site Prep	15,000 ft^2	26,000 ft^2	40,000 ft^2
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Liquid	3 meals/day	9 meals/day	12 meals/day
Laundry	1,000 lb/wk	2,000 lb/wk	3,600 lb/wk
Vehicle Maintenance	TBD	TBD	TBD
Power	65kW ECS	100kW ECS	200kW ECS
POL			
Diesel	0	150gal/day	300gal/day
Water (potable)	400gal/day	800 gal/day	1430 gal/day
Ice	0	85 lb/day	150 lb/day
Waste			
Medical Waste			
Liquid	700 gal/day	1400 gal/day	2500 gal/day
Solid	180 lb/day	610 lb/day	1100 lb/day
Communications			
Phone	9 (4 cell, 3 land, 2 crash)	10 (4 cell, 4 land, 2 crash)	12 (4 cell, 6 land, 2 crash)
Satellite/Tele Medicine	1	1	1
Land Mobile Radio (LMR)	8	8	8
STU III	1	1	1
Oxygen (LOX)	40L/day	60 L/day	90 L/day
ECU Units	3	6	9
Pallets	3	13	26

10

	EMEDS+25 Bed AFTH (III)	EMEDS+50 AFTH Estimate	EMEDS+114 Bed AFTH Estimated NOT Validated
Site Prep	40,000 ft^2	50,000 ft^2	110,000 ft^2
Work Shelter	5850 sq ft	8410 sq ft	
Billeting	88 people	114 people	299 people
Latrine/Showers	113 people	164 people	413 people
FoodService			
Regular	337 meals/day	492 meals/day	1239 meals/day
Liquid	12 meals/day	20 meals/day	45 meals/day
Laundry	3,600 lb/wk	9,000 lb/wk	20,920 lb/wk
Vehicle Maintenance	TBD	TBD	TBD
Power	200kW ECS	200kW ECS	400kW ECS
POL			
Diesel	300gal/day	1000gal/day	2280 gal/day
Water (potable)	1430 gal/day	5500 gal/day	11000 gal/day
Ice	150 lb/day	300 lb/day	675 lb/day
Waste			
Medical/Waste			
	2500 gal/day	4950 gal/day	11286 gal/day
Solid	1100 lb/day	TBD	TBD
Communications			
Phone	12 (4 cell, 6 land, 2 crash)	14 (4 cell, 8 land, 2 crash)	24 (4 cell, 6 land, 2 crash)
Satellite/Tele Medicine	1	1	1
Land Mobile Radio (LMR)	8	TBD	TBD
STU III	1	1	1
Oxygen (LOX)	90 L/day	180 L/day	410 L/day
ECU Units	9	16	33
Pallets	26	TBD	TBD
Equipment Movement	13K forklift, flatbed truck	13K forklift, flatbed truck	13K forklift, flatbed truck

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	EMEDS+25 Bed AFTH (III)	EMEDS+50 AFTH Estimate	EMEDS+114 Bed AFTH Estimated NOT Validated
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Laundry	3,600 lb/wk	9,000 lb/wk	20,920 lb/wk
Vehicle Maintenance	TBD	TBD	TBD
Power	200kW ECS	200kW ECS	400kW ECS
POL			
Diesel	300gal/day	1000gal/day	2280 gal/day
Water (potable)	1430 gal/day	5500 gal/day	11000 gal/day
Ice	150 lb/day	300 lb/day	675 lb/day
Waste			
Medical/Waste			
	2500 gal/day	4950 gal/day	11286 gal/day
Solid	1100 lb/day	TBD	TBD
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Phone	12 (4 cell, 6 land, 2 crash)	14 (4 cell, 8 land, 2 crash)	24 (4 cell, 6 land, 2 crash)
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Land Mobile Radio (LMR)	8	TBD	TBD
STU III	1	1	1
Oxygen (LOX)	90 L/day	180 L/day	410 L/day
ECU Units	9	16	33
Pallets	26	TBD	TBD
Equipment Movement	13K forklift, flatbed truck	13K forklift, flatbed truck	13K forklift, flatbed truck

EMEDS Basic					
AFSC	Rank	Title	QTY	UTC	Authorized Substitute
040C0	0-5	Commander	1	FFEP2	C4XXX
041A3	0-3	Health Services Admin	1	FFEP2	04XXX
43E3A	0-4	Bioenvironmental Engineer	1	FFGL3	4B071
043H3	0-4	Public Health Officer	1	FFGL2	4E071
044E3A	0-3	Emergency Medicine Specialist	1	FFMFS	044F3
044M3	0-3	Internist	1	FFEP1	
045A3	0-4	Anesthesiologist	1	FFMFS	046M3
045B3	0-4	Orthopedic Surgeon	1	FFMFS	
045S3	0-4	General Surgeon	1	FFMFS	
046N3	0-3	Clinical Nurse	1	FFEP6	
046N3E	0-3	Critical Care Nurse	1	FFEP1	
046S3	0-3	OR Nurse	1	FFMFS	
047G3A	0-4	Comprehensive Dentist	1	FFEP2	047G3C
048A3	0-5	Aerospace Medicine Specialist	1	FFGL2	
048F3	0-4	Aerospace Medicine (Family Practice)	1	FFDAB	048G3
4A171		Medical Materiel Craftsman	1	FFEP2	
4A271		Biomedical Equipment Repair Craftsman	1	FFEP2	
4F051		Aeromedical Services Journeyman	1	FFDAB	4N051
4F071		Aeromedical Services Craftsman	1	FFDAB	4N071
4H071		Cardiopulmonary Lab Craftsman	1	FFEP1	4N071-487
4N051		Medical Services Journeyman	4	FFEP6	4F051
4F071-496		Independent Duty Medical Craftsman	1	FFGL3	4N071-496

Total 25

CHAPTER 3 EMEDS Personnel Packages

EMEDS Basic					
AFSC	Rank	Title	QTY	UTC	Authorized Substitute
040C0	0-5	Commander	1	FFEP2	C4XXX
041A3	0-3	Health Services Admin	1	FFEP2	04XXX
43E3A	0-4	Bioenvironmental Engineer	1	FFGL3	4B071
043H3	0-4	Public Health Officer	1	FFGL2	4E071
044E3A	0-3	Emergency Medicine Specialist	1	FFMFS	044F3
044M3	0-3	Internist	1	FFEP1	
045A3	0-4	Anesthesiologist	1	FFMFS	046M3
045B3	0-4	Orthopedic Surgeon	1	FFMFS	
045S3	0-4	General Surgeon	1	FFMFS	
046N3	0-3	Clinical Nurse	1	FFEP6	
046N3E	0-3	Critical Care Nurse	1	FFEP1	
046S3	0-3	OR Nurse	1	FFMFS	
047G3A	0-4	Comprehensive Dentist	1	FFEP2	047G3C
048A3	0-5	Aerospace Medicine Specialist	1	FFGL2	
048F3	0-4	Aerospace Medicine (Family Practice)	1	FFDAB	048G3
4A171		Medical Materiel Craftsman	1	FFEP2	
4A271		Biomedical Equipment Repair Craftsman	1	FFEP2	
4F051		Aeromedical Services Journeyman	1	FFDAB	4N051
4F071		Aeromedical Services Craftsman	1	FFDAB	4N071
4H071		Cardiopulmonary Lab Craftsman	1	FFEP1	4N071-487
4N051		Medical Services Journeyman	4	FFEP6	4F051
4F071-496		Independent Duty Medical Craftsman	1	FFGL3	4N071-496

12

Total 25

EMEDS +10

AFSC	Rank	Title	QTY	UTC	Authorized Substitute
046N3	0-4	Clinical Nurse	1	FFEP3	
046N3	0-3	Clinical Nurse	2	FFEP3	
046N3E	0-3	Critical Care Nurse	2	FFEP3	
048F3	0-4	Aerospace Medicine (Family Practice)	1	FFEP3	048G3
4A051		Health Services Management Journeyman	1	FFEP3	
4A071		Health Services Management Craftsman	2	FFEP3	
4A151		Medical Materiel Journeyman	1	FFEP3	
4B051		Bioenvironmental Engineer Journeyman	1	FFGL4	
4B071		Bioenvironmental Engineer Craftsman	1	FFGL4	043E3A
43A3	0-4	Aerospace Physiologist	1	FFGL4	
044F3	0-4	Family Physician	1	FFEP3	
4E051		Public Health Journeyman	1	FFGL4	
4E071		Public Health Craftsman	1	FFGL4	043H3
4N051		Medical Services Journeyman	8	FFEP3	4F051
4N071		Medical Services Craftsman	1	FFEP3	
4F071-496		Independent Duty Medical Craftsman	1	FFEP3	4N071-496
4N151		Surgical Services Journeyman	1	FFEP3	
P071		Pharmacy Craftsman	1	FFEP3	
4R071		Radiology Craftsman	1	FFEP3	
4T071		Medical Laboratory Craftsman	1	FFEP3	
4Y071		Dental Craftsman	1	FFEP3	
		Totals:	31		TOTAL 56

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EMEDS +10

AFSC	Rank	Title	QTY	UTC	Authorized Substitute
046N3	0-4	Clinical Nurse	1	FFEP3	
046N3	0-3	Clinical Nurse	2	FFEP3	
046N3E	0-3	Critical Care Nurse	2	FFEP3	
048F3	0-4	Aerospace Medicine (Family Practice)	1	FFEP3	048G3
4A051		Health Services Management Journeyman	1	FFEP3	
4A071		Health Services Management Craftsman	2	FFEP3	
4A151		Medical Materiel Journeyman	1	FFEP3	
4B051		Bioenvironmental Engineer Journeyman	1	FFGL4	
4B071		Bioenvironmental Engineer Craftsman	1	FFGL4	043E3A
43A3	0-4	Aerospace Physiologist	1	FFGL4	
044F3	0-4	Family Physician	1	FFEP3	
4E051		Public Health Journeyman	1	FFGL4	
4E071		Public Health Craftsman	1	FFGL4	043H3
4N051		Medical Services Journeyman	8	FFEP3	4F051
4N071		Medical Services Craftsman	1	FFEP3	
4F071-496		Independent Duty Medical Craftsman	1	FFEP3	4N071-496
4N151		Surgical Services Journeyman	1	FFEP3	
P071		Pharmacy Craftsman	1	FFEP3	
4R071		Radiology Craftsman	1	FFEP3	
4T071		Medical Laboratory Craftsman	1	FFEP3	
4Y071		Dental Craftsman	1	FFEP3	
		Totals:	**31**		**TOTAL 56**

EMEDS+25

AFSC	Rank	Title	(PAR 3000-5000) QTY	UTC	Authorized Substitute
041A3	0-4	Health Services Admin	1	FFEP4	
042B3	0-3	Physical Therapist	1	FFEP4	
043P3	0-3	Pharmacist	1	FFEP4	
043T3A	0-3	Biomedical Lab Scientist	1	FFEP4	
044F3	0-3	Family Physician	1	FFEP4	042G3 or 46N3H
045S3	0-4	General Surgeon	1	FFEP5	
046M3	0-3	Nurse Anesthetist	1	FFEP5	045A3
046A3	04-5	Nursing Admin	1	FFEP4	046A3
046N3	0-3	Clinical Nurse	4	FFEP4	
046S3	0-4	OR Nurse	1	FFEP5	
047G3C	0-4	Dentist	1	FFEP4	
4A051		Health Services Management Journeyman	3	FFEP4	
4A151		Medical Materiel Journeyman	1	FFEP4	
4A251		Biomedical Equipment Repair Journeyman	1	FFEP4	
4D071		Dietary Craftsman	1	FFEP4	
4N051		Medical Services Journeyman	3	FFEP4	4F051
4N071		Medical Services Craftsman	2	FFEP4	
4N091		Medical Services Superintendent	1	FFEP4	
4N151		Surgical Services Journeyman	2	FFEP5	
4R051		Radiology Journeyman	1	FFEP4	
4T051		Medical Laboratory Journeyman	1	FFEP4	
		Totals:	**30**		**TOTAL 86**

EMEDS + 25

AFSC	Rank	Title	(PAR 3000-5000) QTY	UTC	
041A3	0-4	Health Services Admin	1	FFEP4	
042B3	0-3	Physical Therapist	1	FFEP4	
043P3	0-3	Pharmacist	1	FFEP4	
043T3A	0-3	Biomedical Lab Scientist	1	FFEP4	
044F3	0-3	Family Physician	1	FFEP4	042G3 or 46N3H
045S3	0-4	General Surgeon	1	FFEP5	
046M3	0-3	Nurse Anesthetist	1	FFEP5	045A3
046A3	04-5	Nursing Admin	1	FFEP4	046A3
046N3	0-3	Clinical Nurse	4	FFEP4	
046S3	0-4	OR Nurse	1	FFEP5	
047G3C	0-4	Dentist	1	FFEP4	
4A051		Health Services Management Journeyman	3	FFEP4	
4A151		Medical Materiel Journeyman	1	FFEP4	
4A251		Biomedical Equipment Repair Journeyman	1	FFEP4	
4D071		Dietary Craftsman	1	FFEP4	
4N051		Medical Services Journeyman	3	FFEP4	4F051
4N071		Medical Services Craftsman	2	FFEP4	
4N091		Medical Services Superintendent	1	FFEP4	
4N151		Surgical Services Journeyman	2	FFEP5	
4R051		Radiology Journeyman	1	FFEP4	
4T051		Medical Laboratory Journeyman	1	FFEP4	
		Totals:	**30**		**TOTAL 86**

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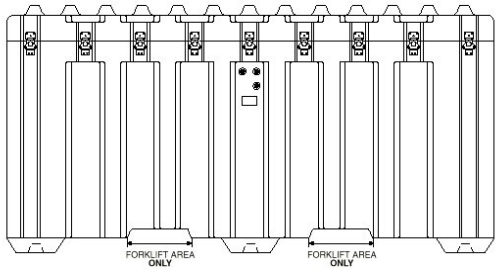
CHAPTER 4 Tent Construction

Alaska Industrial Resources Seattle, Washington, developed the modified Alaska Shelter for use by the Air Force Medical Service. This chapter outlines the basic steps necessary to construct this tent. Single tents are connected to each other through the use of extensions and vestibules. Instructions for construction of these components can be found in the Alaska Shelter book located in each tent container.

Step 1: Unpack container and separate items into like parts



Container with Medical Shelter: Weight = 1,400 lbs.
Container (Empty): Weight = 315 lbs.
Container (Full) Weight = 2,115 lbs. maximum
Container Dimensions: Width = 41 1/4”
Length = 102”
Height = 51”
Extension Shelter (without container) Weight = 335 lbs.
Vestibule Shelter (without container) Weight = 195 lbs.

CHAPTER 4 Tent Construction

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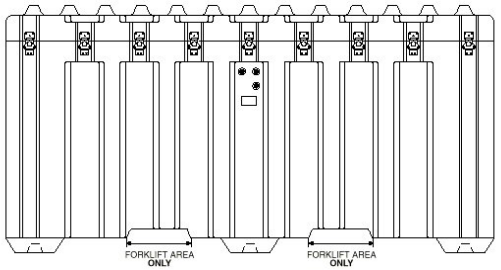
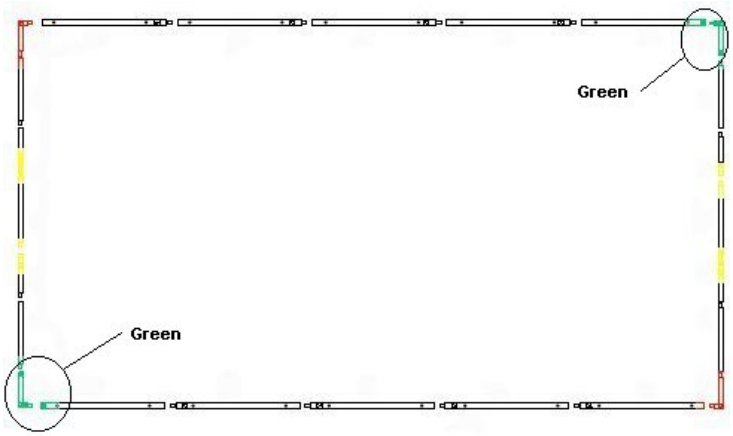


Container with Medical Shelter: Weight = 1,400 lbs.
Container (Empty): Weight = 315 lbs.
Container (Full) Weight = 2,115 lbs. maximum
Container Dimensions: Width = 41 1/4”
Length = 102”
Height = 51”
Extension Shelter (without container) Weight = 335 lbs.
Vestibule Shelter (without container) Weight = 195 lbs.

16

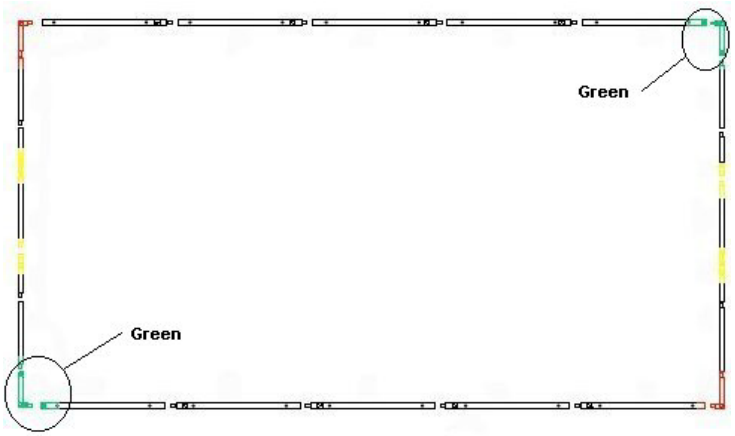
STEP 2. Lay out and Assemble base



Start base assembly using green corner pieces. Facing short side of shelter, green corners are on the right and red corners on the left. Each long side of shelter has six base stubs for arches. Pin from outside to inside.

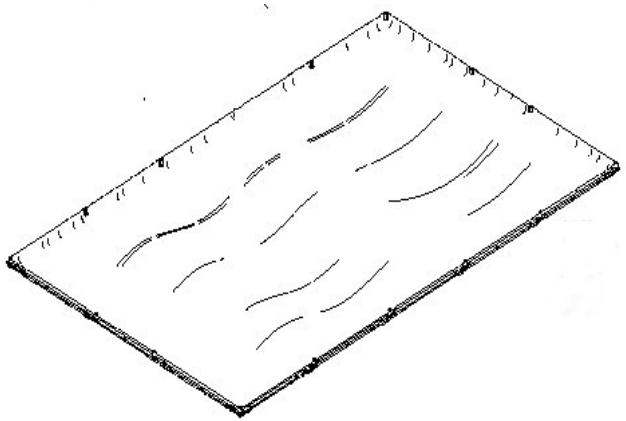
17

STEP 2. Lay out and Assemble base



Start base assembly using green corner pieces. Facing short side of shelter, green corners are on the right and red corners on the left. Each long side of shelter has six base stubs for arches. Pin from outside to inside.

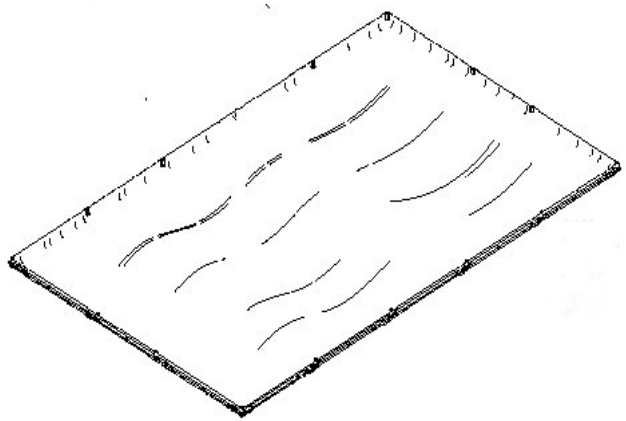
STEP 3. Attach floor to base



VERY IMPORTANT

Ensure floor material is spread evenly without bunching of material. This method is useful in squaring the frame. The squared base is approximately 38’ 3” outside corner to outside corner.

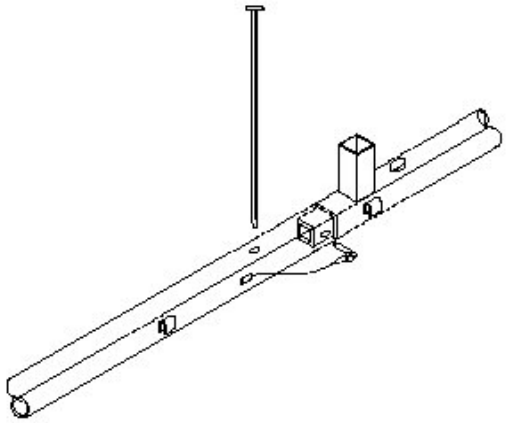
STEP 3. Attach floor to base



VERY IMPORTANT

Ensure floor material is spread evenly without bunching of material. This method is useful in squaring the frame. The squared base is approximately 38’ 3” outside corner to outside corner.

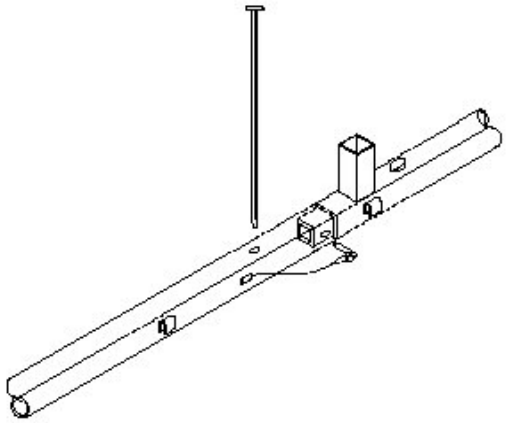
STEP 4. Anchor base



Drive the 18” double-headed spikes through the pre-drilled anchor holes in the base into the ground, using a sledgehammer. **Do not** stake removable doorway pieces

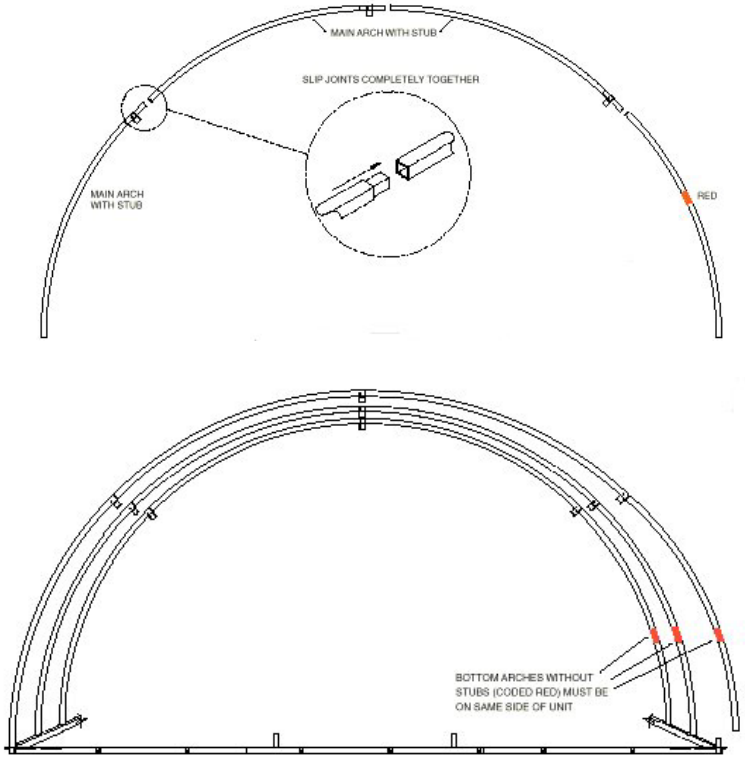
19

STEP 4. Anchor base



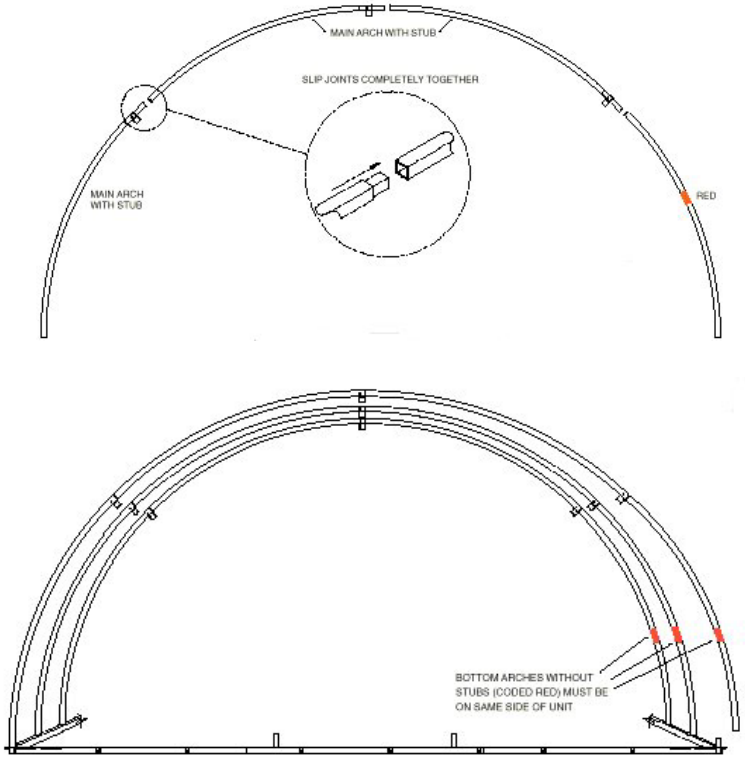
Drive the 18” double-headed spikes through the pre-drilled anchor holes in the base into the ground, using a sledgehammer. **Do not** stake removable doorway pieces

STEP 5. Assemble and raise arches



Assemble arches on the ground as shown in top figure above. Keeping all joints completely slip-fitted together, stand assembled arch and set one end on base stub as shown in Figure below. Holding arch firmly, spring the other end onto its base stub. Repeat above procedure until all remaining arches are assembled onto base (Except for surgery/dental/social worker suite installation.)

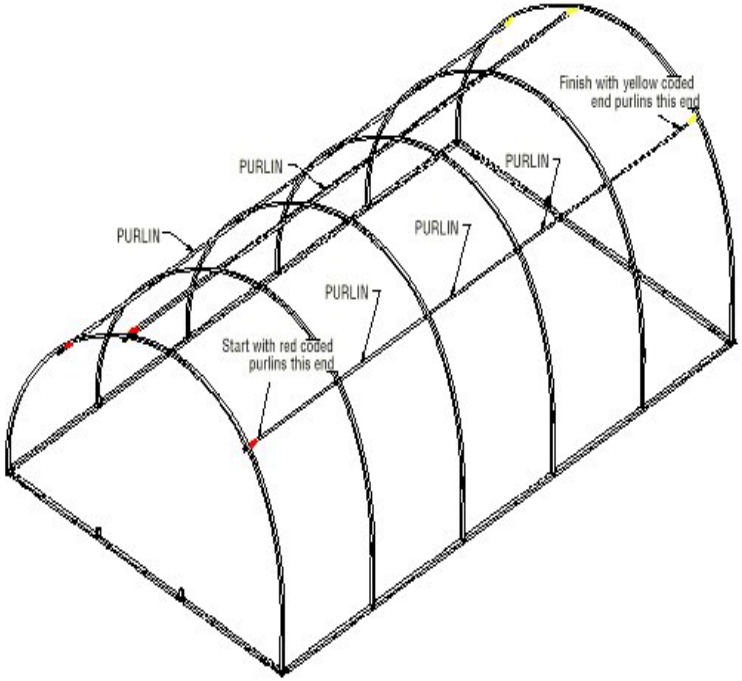
STEP 5. Assemble and raise arches



Assemble arches on the ground as shown in top figure above. Keeping all joints completely slip-fitted together, stand assembled arch and set one end on base stub as shown in Figure below. Holding arch firmly, spring the other end onto its base stub. Repeat above procedure until all remaining arches are assembled onto base (Except for surgery/dental/social worker suite installation.)

20

STEP 6. Install Purlins



Install three rows of purlins that connect between arches. Purlins are slipped into purlin sleeves on arches and pinned. Ensure outside purlin pins are installed from top down. Start with red coded purlins on one end and work toward other end where yellow coded end purlins are used. With one person on ladder and two on ground, insert purlins between each arch simultaneously to make assembly easier and faster.

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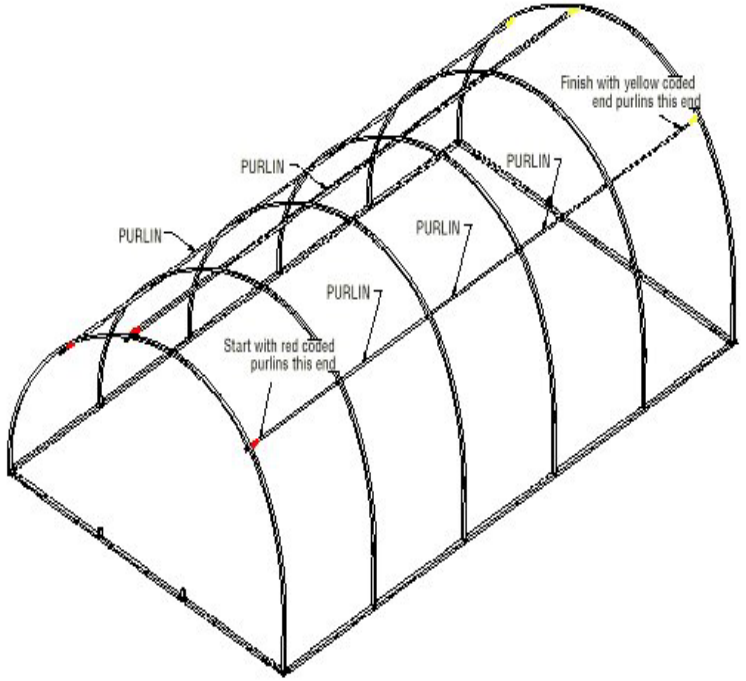
STEP 6. Install Purlins



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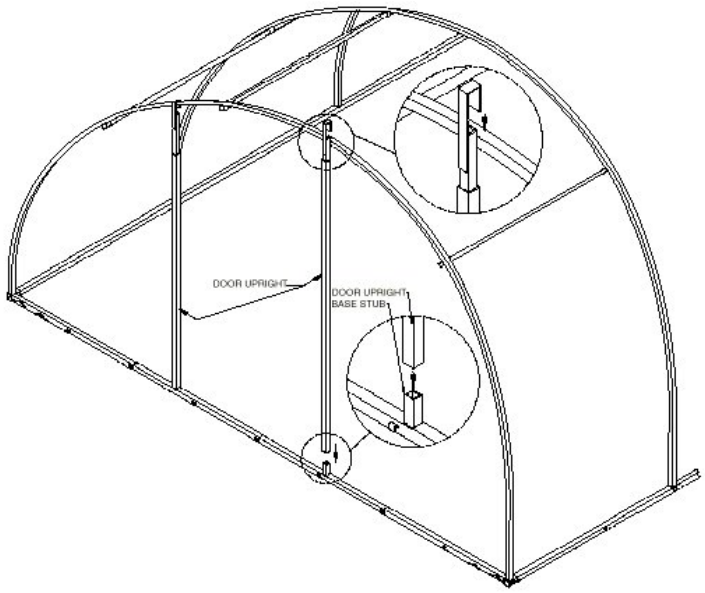
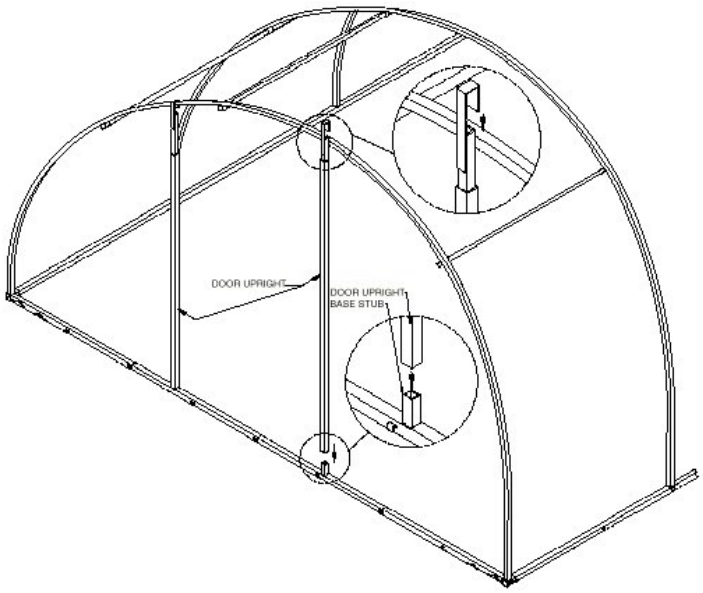
STEP 7. Install uprights



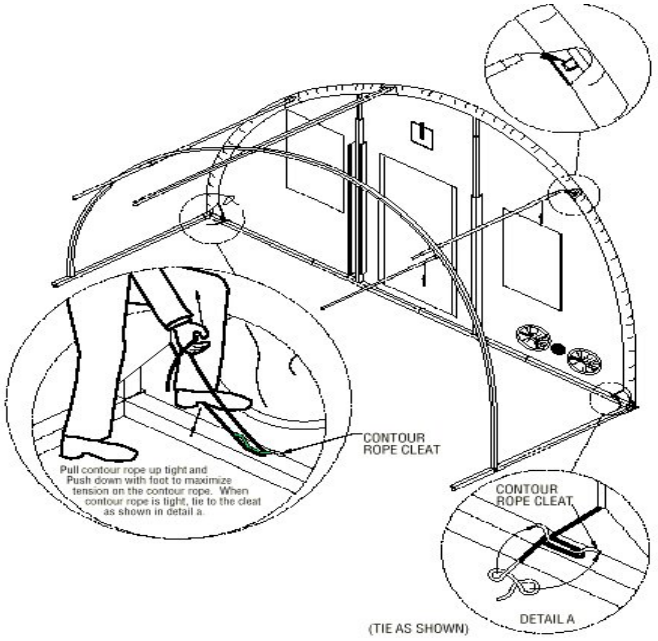
Insert the upright insert into the top of the end upright. Lift the upright up and slip the insert over the arch placing the upright down onto its base stub.
Pay attention to the instructions stenciled on the end uprights. Plumb end upright and ensure the insert bolt threads are toward the inside of the shelter.

STEP 7. Install uprights



Insert the upright insert into the top of the end upright. Lift the upright up and slip the insert over the arch placing the upright down onto its base stub.
Pay attention to the instructions stenciled on the end uprights. Plumb end upright and ensure the insert bolt threads are toward the inside of the shelter.

STEP 8. Install end panels



Lay out zippered end panel at one end of unit with white side facing up. Tie one end of the base rope to the yellow coded tie off cleat. Stretch the other end tight and secure to its yellow coded tie off cleat. Remove the purlin pins on the end arch only so the purlin can be separated from purlin sleeve and the end cover rope can be slipped underneath purlin. Start with the center of the end panel and work toward each side. Lift the end panel up and work the contour edge up and over the end arch. Slip the contour rope under the disconnected purlins and then reconnect purlins and pin. Keeping the end panel centered, tension both ends of the contour rope tightly by running the rope under the green tie off cleat and using a foot to pry on the rope. Continue working the edge of the end panel over the arch. When the end panel is snug, and the rope is tensioned, tightly secure the contour rope ends to the green coded tie off cleat. Using the hook tools, secure the end panel base rope to the base hooks.

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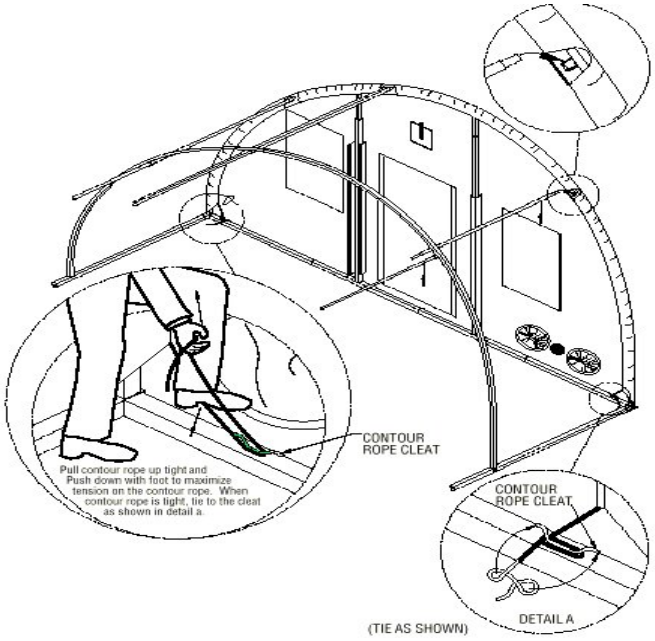
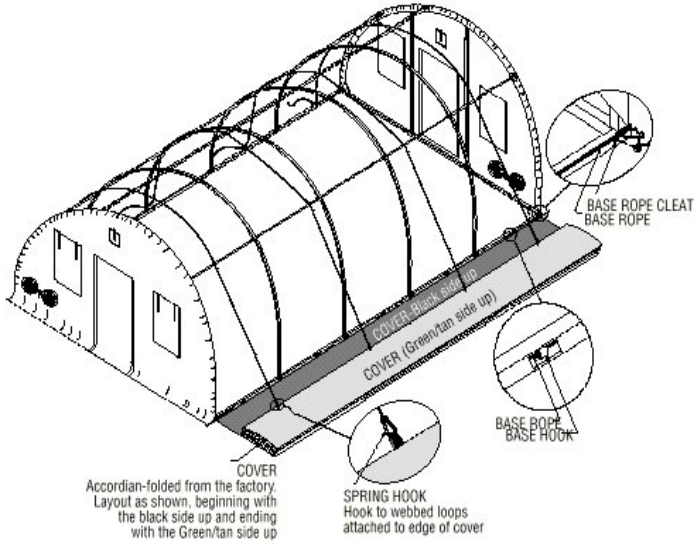
STEP 8. Install end panels



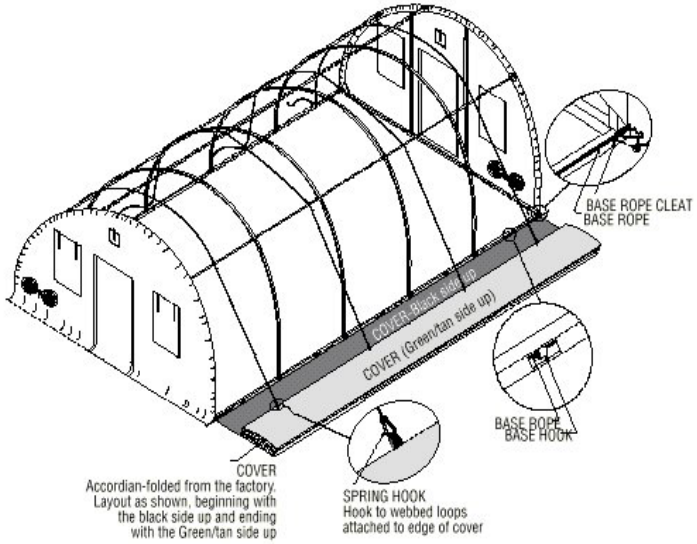
Lay out zippered end panel at one end of unit with white side facing up. Tie one end of the base rope to the yellow coded tie off cleat. Stretch the other end tight and secure to its yellow coded tie off cleat. Remove the purlin pins on the end arch only so the purlin can be separated from purlin sleeve and the end cover rope can be slipped underneath purlin. Start with the center of the end panel and work toward each side. Lift the end panel up and work the contour edge up and over the end arch. Slip the contour rope under the disconnected purlins and then reconnect purlins and pin. Keeping the end panel centered, tension both ends of the contour rope tightly by running the rope under the green tie off cleat and using a foot to pry on the rope. Continue working the edge of the end panel over the arch. When the end panel is snug, and the rope is tensioned, tightly secure the contour rope ends to the green coded tie off cleat. Using the hook tools, secure the end panel base rope to the base hooks.

STEP 9. Install cover



Lay out main cover along one side of the shelter so that when the cover is pulled over, the black side is to the inside of the shelter. Tie off the ends of the cover base rope to the SILVER tie off cleats. Throw four pull-over ropes over the unit and attach the rope snaps to the black pull-over loops along the base edge of the cover that is to be pulled over the frame. To pull cover over the frame, four persons should pull in unison on pull-over ropes. Pull the cover up and over the shelter. The GREEN/TAN color should now be on the outside of the shelter. Secure the base rope on the second side of the unit in the same manner as the previous base rope. Align exposed portions of the base rope with base hooks. Work the ends of the cover over the end arches with one person on a ladder and two persons helping from ground level. The cover should overlap the end panel by 4" to 5". Ensure the overlap of the cover is the same at each end of the shelter (guy rings should be directly over arches). Starting at one end of the cover, slip the cover contour ropes through the slits in the ground flap. Raise ground flap and tens on the contour rope to the RED cleat, using your foot until cover is tight and overlaps th end arches by about 5" on each side of the shelter. Secure ropes to the RED coded cleats. Repeat for the other end of the cover. Using the hook tools, secure the base rope along each side of the cover to the base hooks

STEP 9. Install cover



Lay out main cover along one side of the shelter so that when the cover is pulled over, the black side is to the inside of the shelter. Tie off the ends of the cover base rope to the SILVER tie off cleats. Throw four pull-over ropes over the unit and attach the rope snaps to the black pull-over loops along the base edge of the cover that is to be pulled over the frame. To pull cover over the frame, four persons should pull in unison on pull-over ropes. Pull the cover up and over the shelter. The GREEN/TAN color should now be on the outside of the shelter. Secure the base rope on the second side of the unit in the same manner as the previous base rope. Align exposed portions of the base rope with base hooks. Work the ends of the cover over the end arches with one person on a ladder and two persons helping from ground level. The cover should overlap the end panel by 4" to 5". Ensure the overlap of the cover is the same at each end of the shelter (guy rings should be directly over archs). Starting at one end of the cover, slip the cover contour ropes through the slits in th ground flap. Raise ground flap and tension the contour rope to the RED cleat, using your foot until cover is tight and overlaps the end arches by about 5" on each side of the shelter. Secure ropes to the RED coded cleats. Repeat for the other end of the cover. Using the hook tools, secure the base rope along each side of the cover to the base hooks

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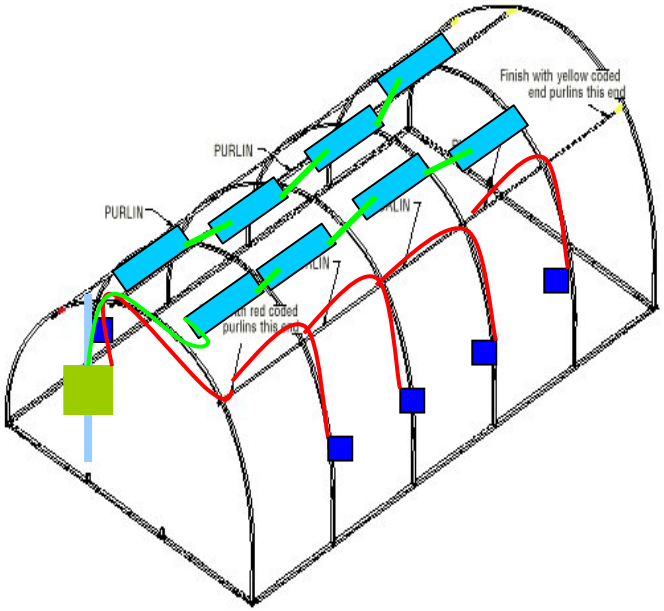
STEP 10. Install power box, electrical outlets and lights

Each tent is supplied with 1 power distribution box and stand, 8 convenience outlets and associated cords, 2 sets of Bruce lights (8 lights) and associated cords. Light are attached midway between center purlin and side purlin.
Lights may also be attached directly to side purlins although this will decrease ambient light within the tent by roughly 27 percent.



25

STEP 10. Install power box, electrical outlets and lights

Each tent is supplied with 1 power distribution box and stand, 8 convenience outlets and associated cords, 2 sets of Bruce lights (8 lights) and associated cords. Light are attached midway between center purlin and side purlin.
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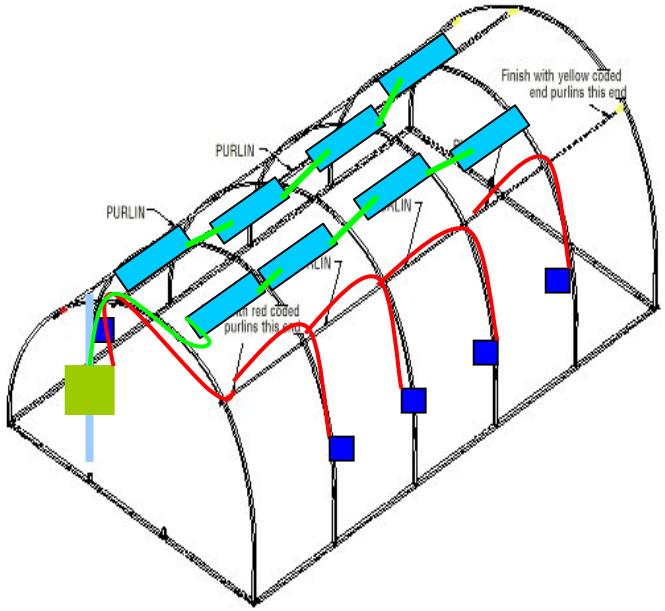


STEP 11. Install internal liners

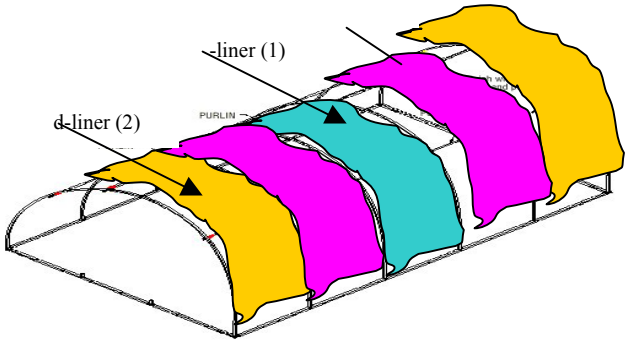
5 separate internal liners, when installed, cover the interior of each tent creating a white tent interior critical in temperature regulation. The five sections consist of: 1 mid-liner; 2 side-liners; 2 end-liners. Each liner is marked with a label identifying its position along the liner's end.

Layout "mid" liner on ground, with the silver side up, in the center bay of shelter (Mid liner is marked "mid" in middle of silver side of liner). Feed each end of the liner over the side purlins.

Line up purlin cutouts on liner with each of the side purlins for proper position of liner.

Attach the two center Velcro straps around the arch, one strap on each side of the center purlin. Attach remaining Velcro straps on to arch. Repeat Velcro strap attachment to other arch for other edge of liner. Layout liner marked "side" liner, with the silver side up, next to "mid" liner in shelter.

NOTE: The long edge of the "side" liner without the Velcro straps must be adjacent to one edge of the "mid" liner. Layout liner marked "end", silver side up, next to the "side" liner. ***NOTE:*** *It may be necessary to loosen the end panel contour rope in order to attach the end-liner to the arch closest to the end panel*



Note: Roof is in place before liners are installed

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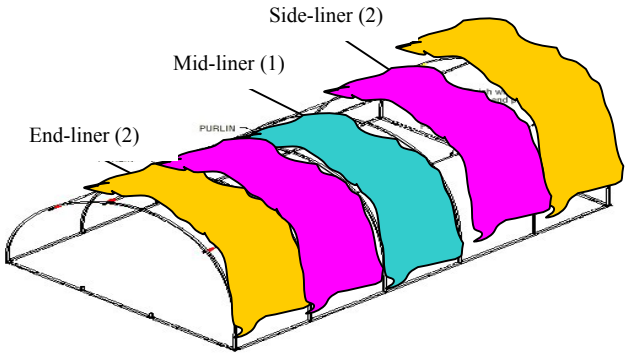

Note: Roof is in place before liners are installed

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STEP 12. Install Plenum

Lay out the straight section of the plenum on the shelter floor parallel with the center purlins. Attach the first grommet to the second center purlin from the end wall where the ECU will be set up. Take the next strap attached to the plenum (straight section) and attach it to the third center purlin. Continue the procedure to install the rest of the straight section. After the plenum straight section is completely installed, connect the elbow section to the inlet (supply) of the air conditioner. Take available strap or strings and connect it to the appropriate grommet (elbow section) and tie it to purlins and end section arch to prevent the plenum from blocking the end section window. To install with a shelter end panel between the main shelter and extension, insert the plenum extension through the 12" x 12" vent opening in the shelter end panel. Align the plenum's neck with the vent opening and leave the "long side" of the plenum extension hanging in the extension shelter. Velcro the end of the "short side" of the plenum extension to the end of the shelter plenum. The plenum will hold itself in place while the ECU is on. The "cap" on the end of the plenum extension can be removed, if desired.

STEP 13. Install Vent Caps

Loosen the 16"x16" flap from the loop fastener at the upper portion of the end wall. Roll the flap inward until it clears the entire opening and tie it with the tie strap. This will prevent water accumulation. Place the plastic vent over the opening and fasten the four flaps from the plastic vent to the four flaps of the opening. Make sure all flaps are completely sealed. This will aid the cooling and heating process of the shelter.

Once the tent is completely built, the lights and outlets have been installed and the liners placed, infrastructure items such tables chairs, desks, and shelves can be put into place. DO NOT PLACE THESE ITEMS INTO THE TENTS PRIOR TO COMPLETION OF TENT BUILDING OR YOU WILL CREATE CONGESTION WITHIN THE TENT AND SLOW THE TENT BUILDING AND LAYOUT PROCESS

27

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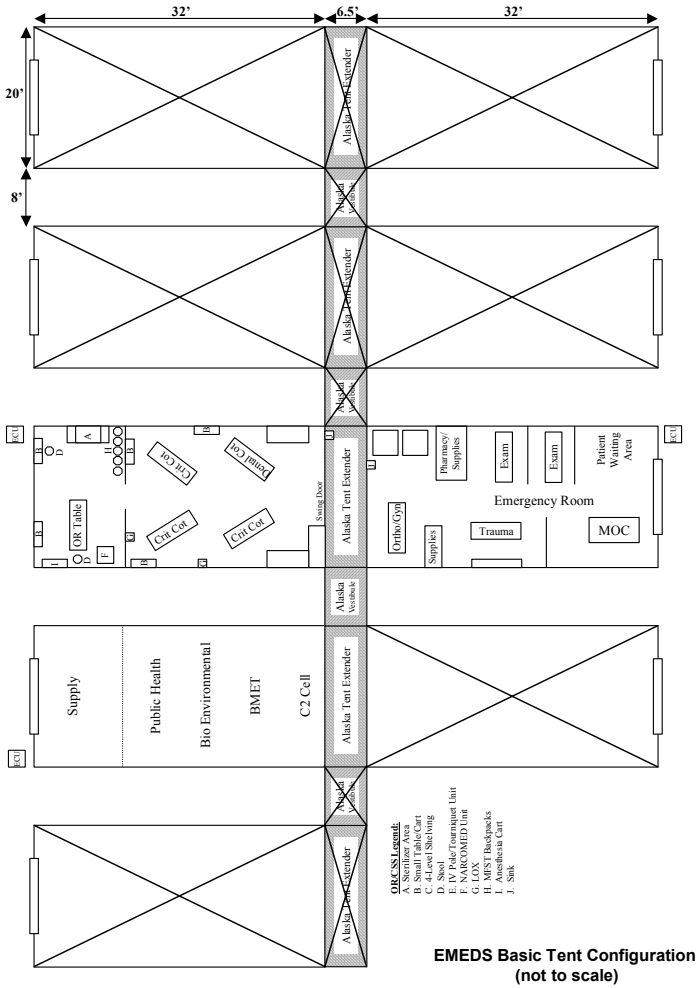
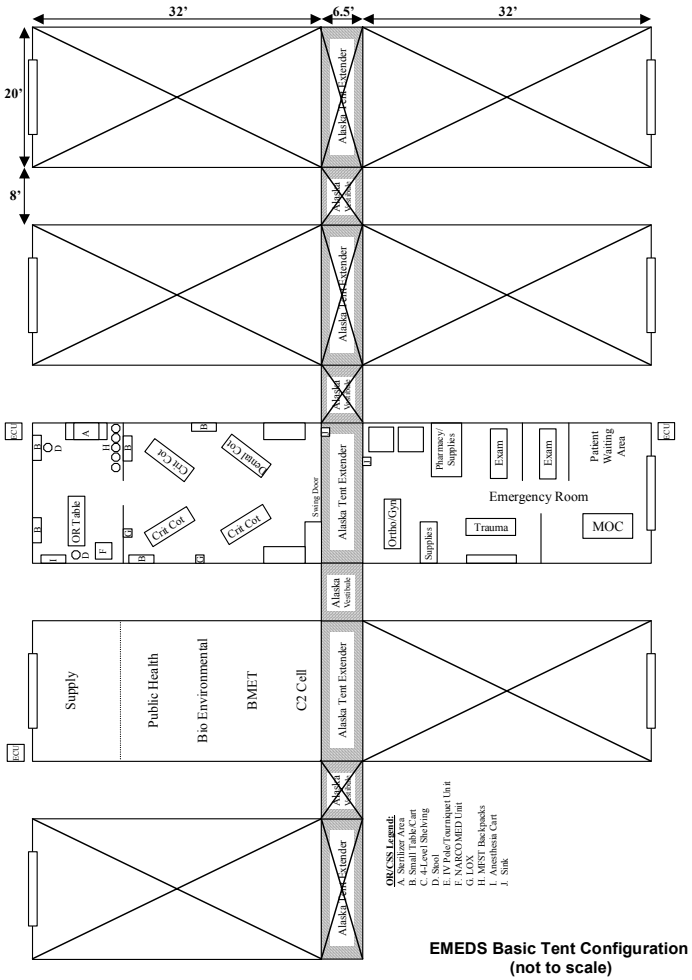


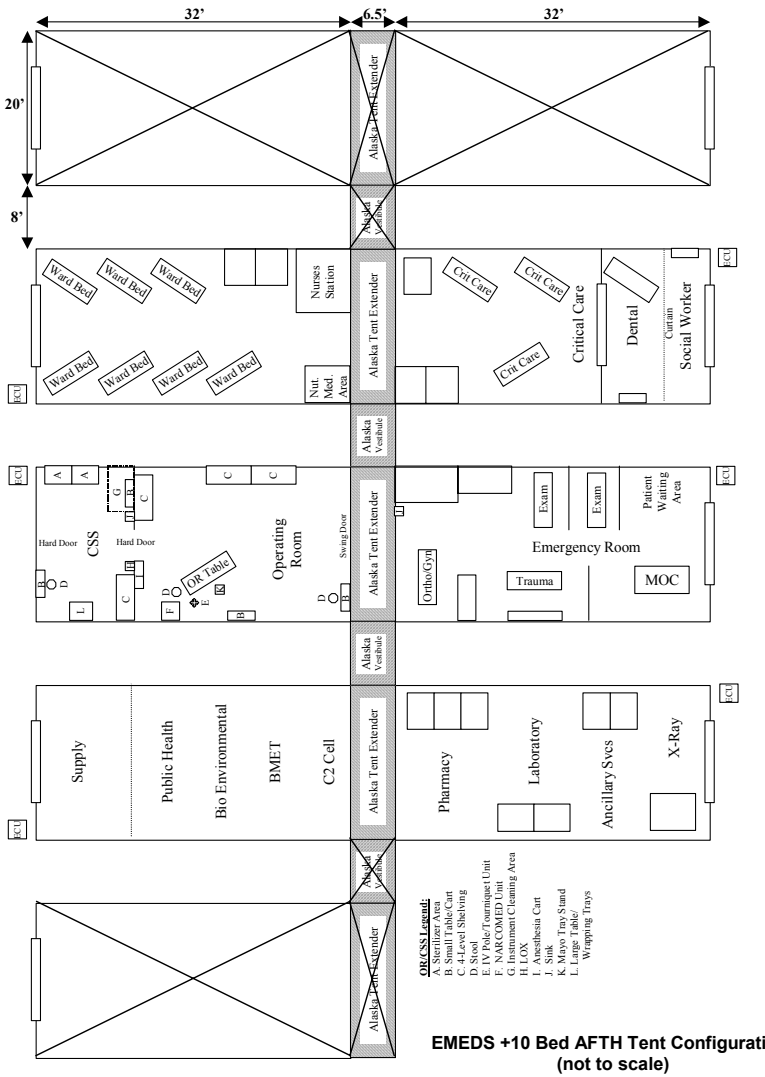
EMEDS Basic Tent Configuration
(not to scale)

CHAPTER 5 EMEDS Basic Facility Layout



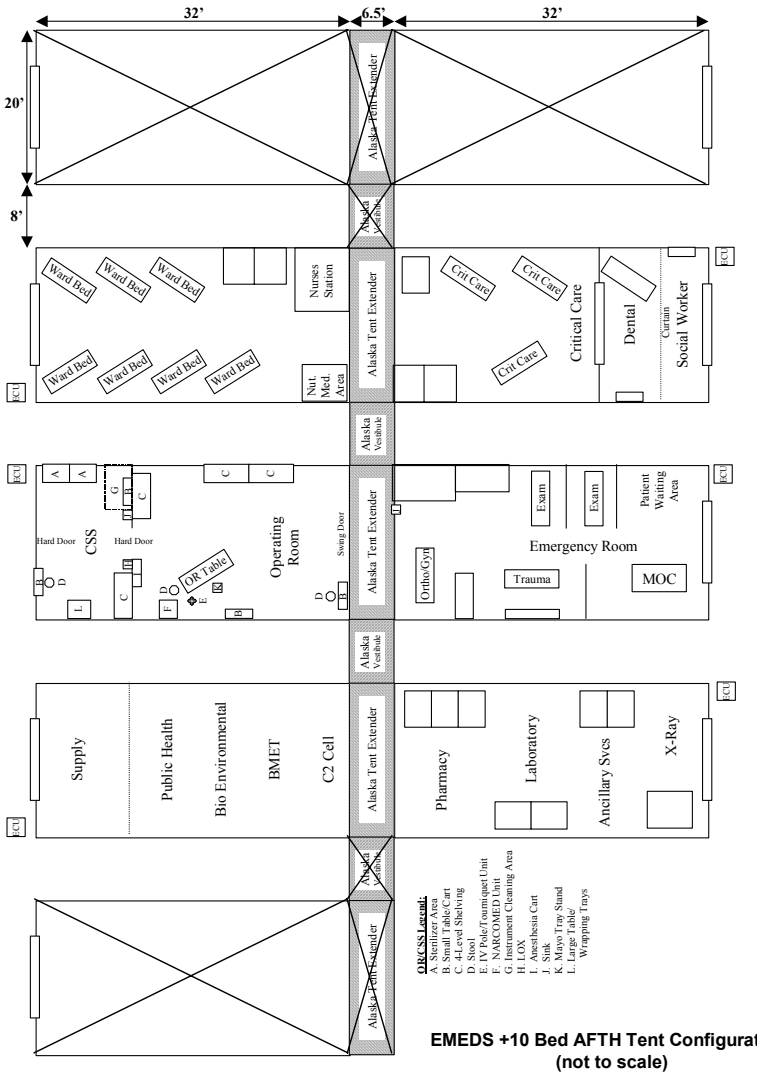
EMEDS Basic Tent Configuration
(not to scale)

28



EMEDS +10 Bed AFTH Tent Configuration
(not to scale)

29



EMEDS +10 Bed AFTH Tent Configuration
(not to scale)

EMEDS +25 Bed AFTH Tent Configuration (not to scale)

EMEDS +25 Bed AFTH Tent Configuration (not to scale)

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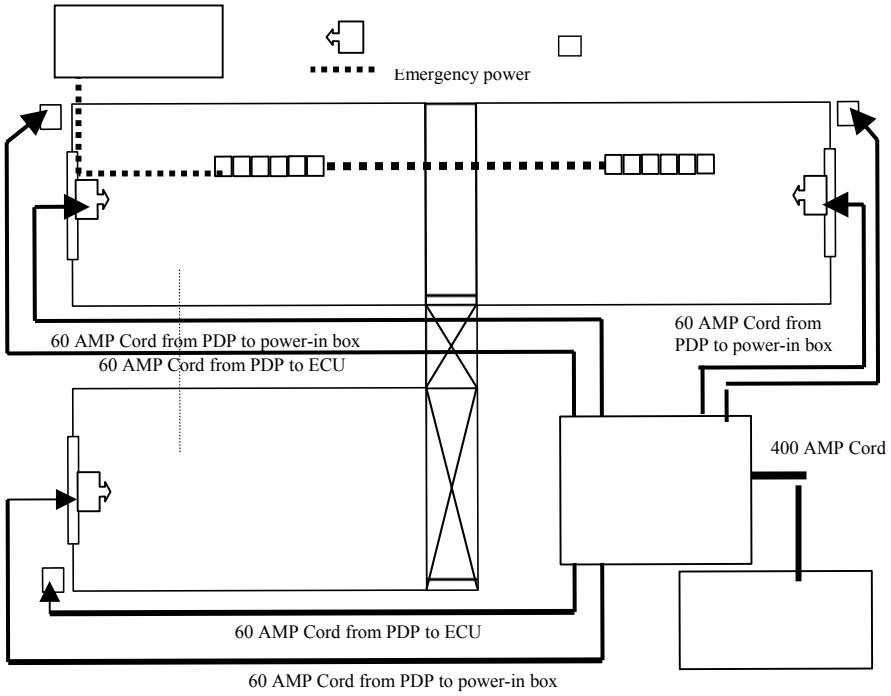
CHAPTER 6 EMEDS Basic Power Grid

The EMEDS Basic package depends on expeditionary combat support (ECS) to supply at least 400 amperes (amps) of electric power and a power distribution panel to the medical facility. In most configurations 60-amp power cords run from a power distribution panel directly to each environmental control unit. A second 60-amp cord runs from the power distribution panel to the power-in outlet of the power box located in each tent.

A 10-kilowatt (kw) commercial gasoline powered generator arrives with the equipment package and is used to run emergency room and operating room lights and power as emergency backup.



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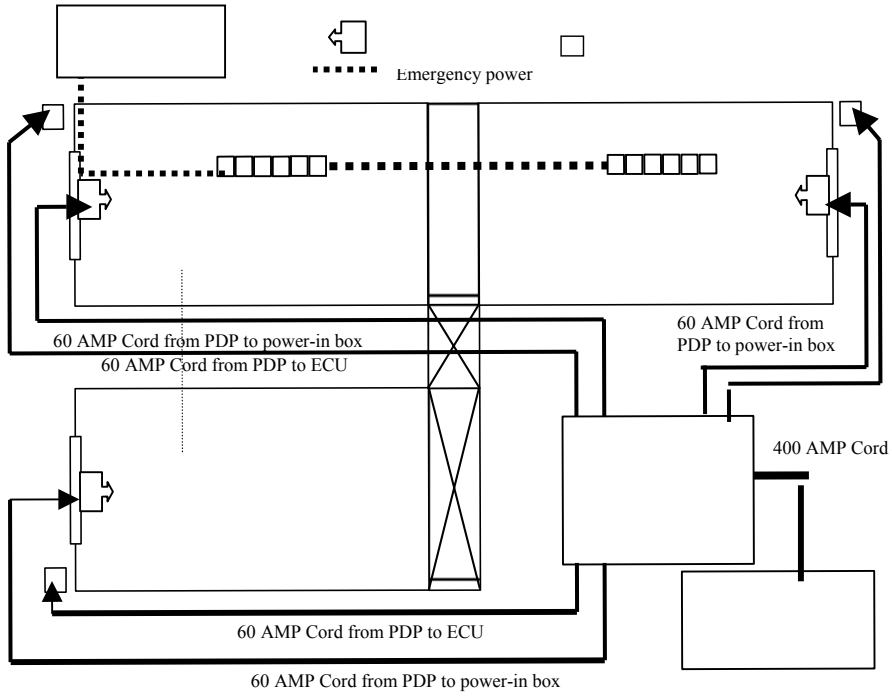

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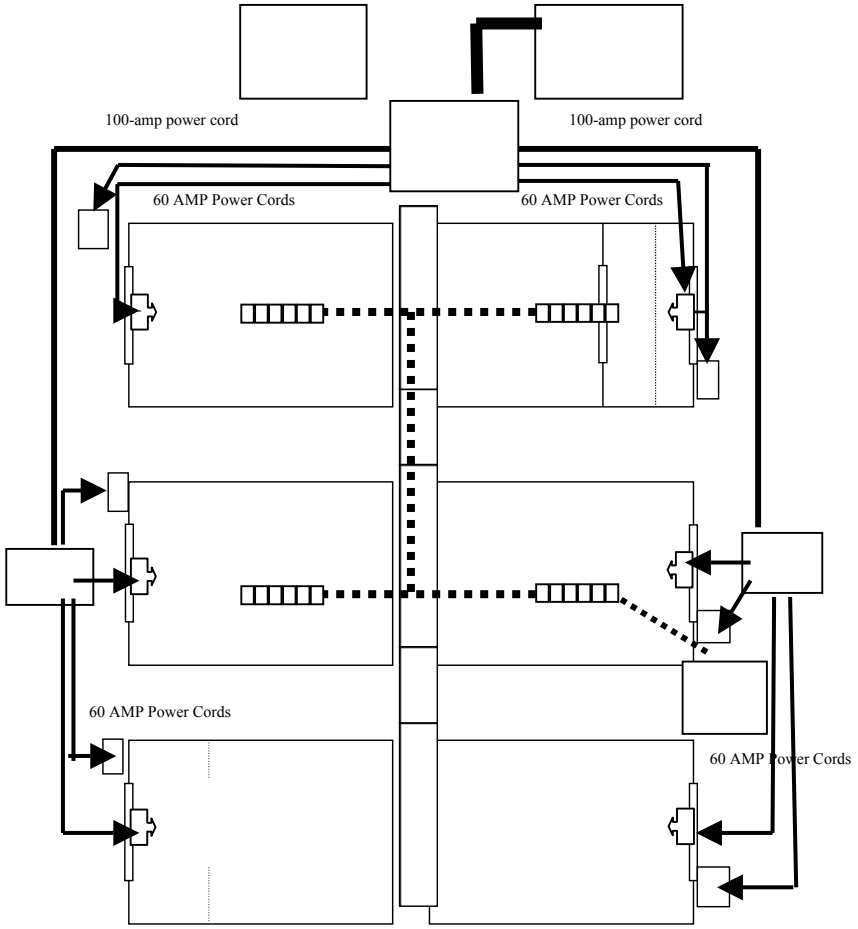
EMEDS +10 Power Grid

EMEDS +10 arrives with two 100-kilowatt (kw) MEP-007 diesel powered generators providing the medical facility with organic power generating capability. Two 30 kw power distribution panels (PDPs) and two 100-amphere power cords are also included. The two 30 kw PDPs allow flexibility in the power-grid layout needed to accommodate additional power requirements of EMEDS +10.



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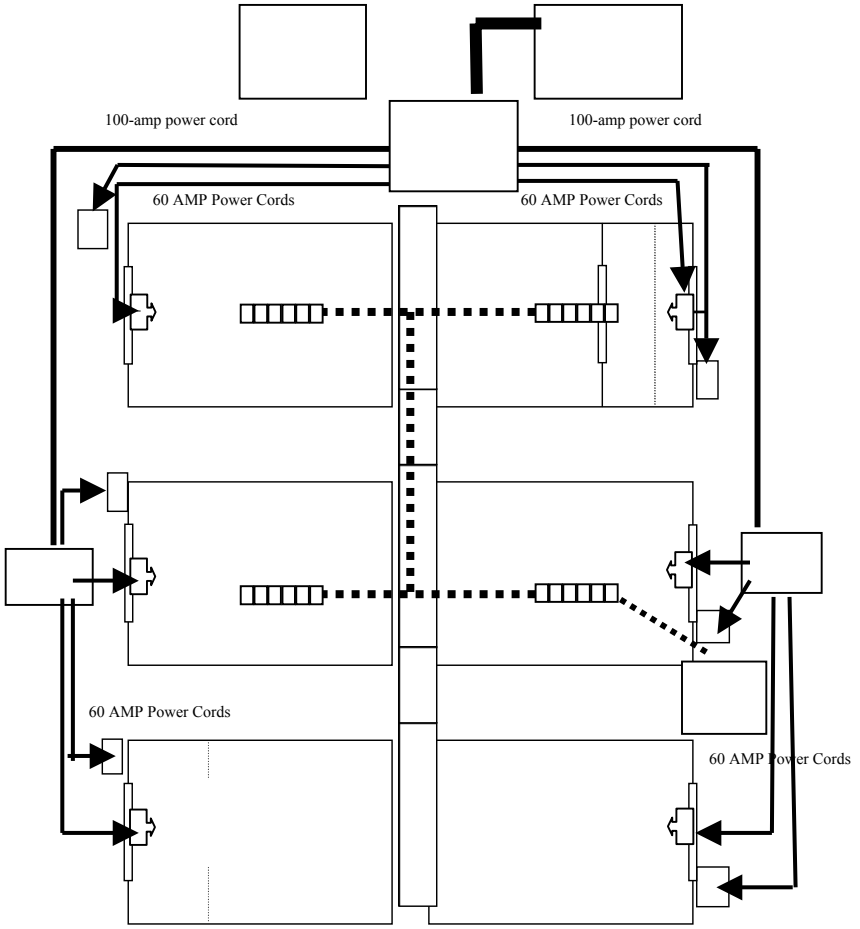
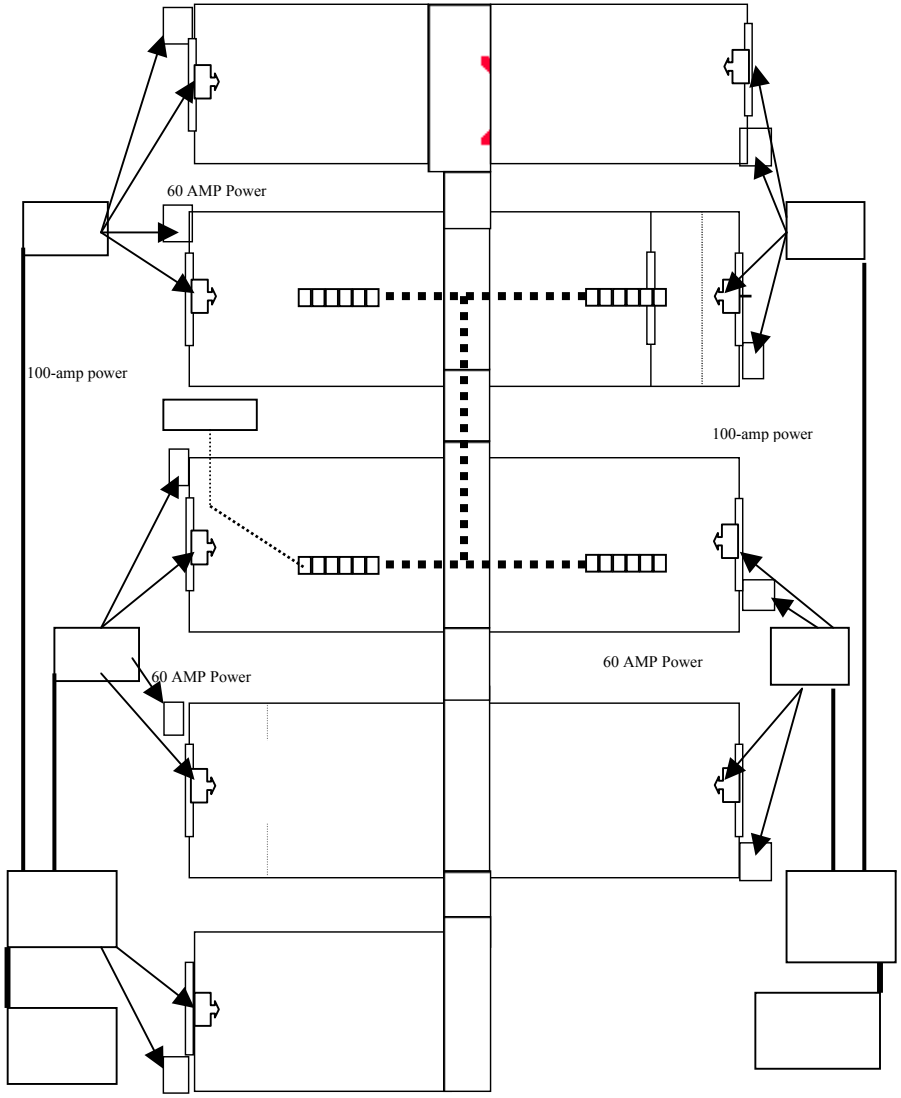
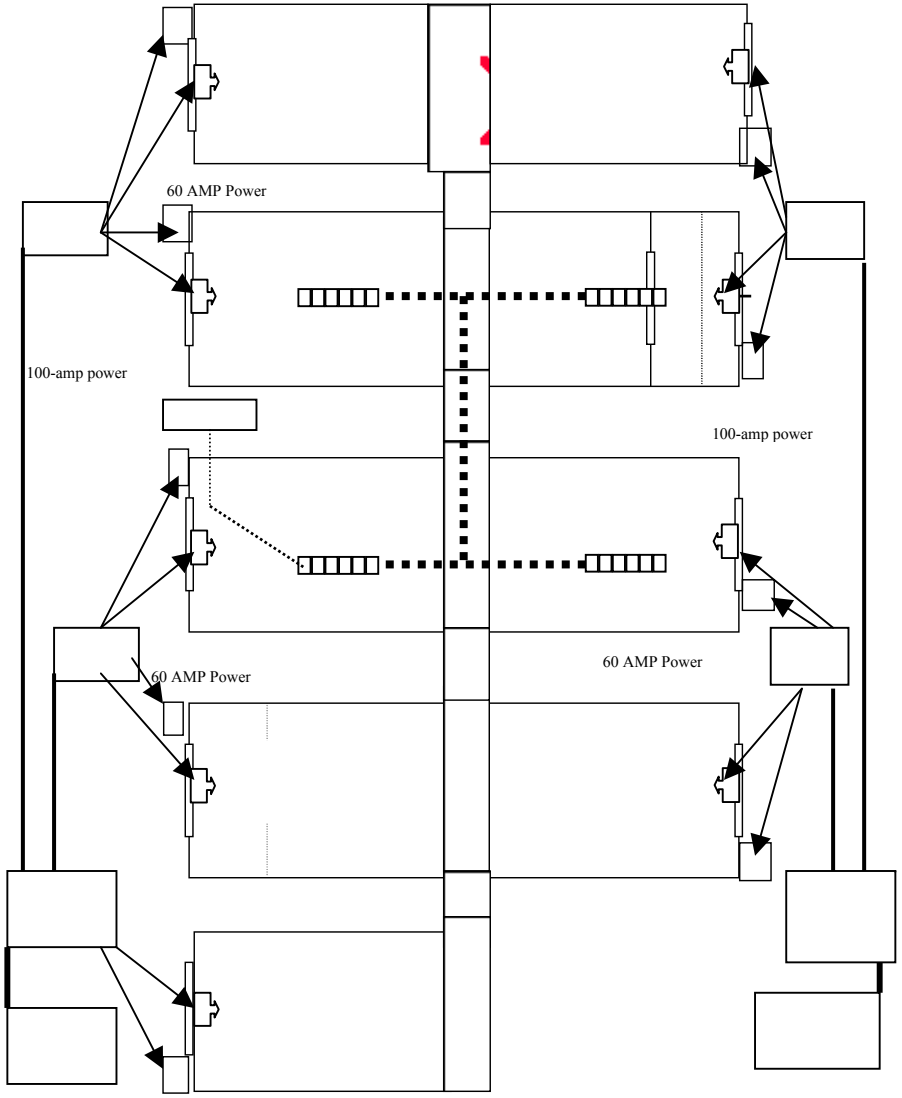


EMEDS +25 Power Grid



EMEDS +25 Power Grid



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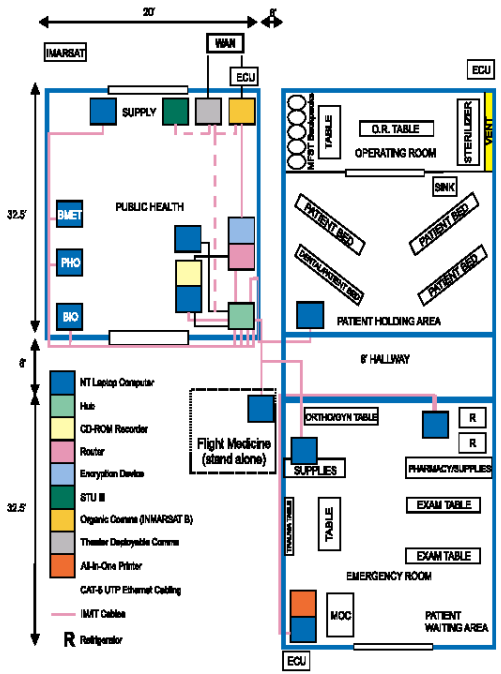
Chapter 7, Information Management/Information Technology

In (EMEDS), the Automated Information Systems (AIS) Local Area Network (LAN) equipment is part of an overall Air Force Theater Medical Information Program (AF-TMIP) infrastructure that seamlessly integrates the operational theater environment by electronically linking deployed Air Force Medical Service (AFMS) components. Variations in laptop placements are authorized based on personal requirements, patient flow, MTF integrity, and availability of resources. The EMEDS Basic IM/IT package contains 10 laptops; one Windows NT Server laptop serves as a file and print share server, one Windows NT Sever laptop serves as a forward deployed standalone server, and 8 additional Windows NT client laptops support a peer-to-peer workgroup environment with intranet/internet capabilities, depending on the availability of Deployed Theater Communications Support. Client workstations are routed through a 3-Com 24 port 10-Base-T Ethernet HUB. Coping, faxing, printing, and scanning capabilities exist through an all-in-one shared network printer. A COMPAC Prolient Server arrives with the EMEDS + 10 IM/IT package with an additional 10 Windows NT laptops supporting 2 24 port 100-Base-T Ethernet Switches, a Primary Domain Controller, a Back-Up Domain Controller, a Member (Application) Server, and two additional network jet direct card printers. The EMEDS + 25 IM/IT package is complemented with 5 additional Windows NT laptops and 2 additional network jet direct card printers.

EMEDS Basic 3-Tent Facility Layout



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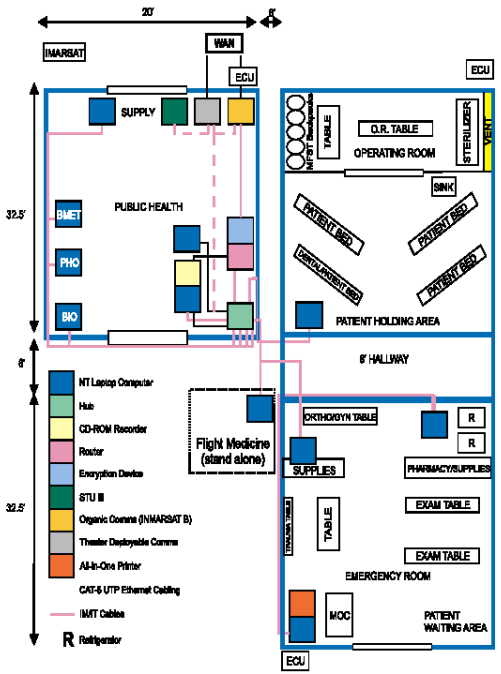
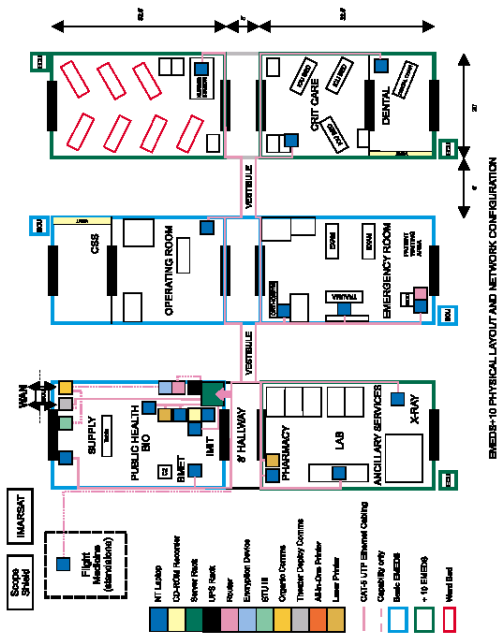


EMEDS +10 IM/IT Schematic

EMEDS +10 Facility Layout



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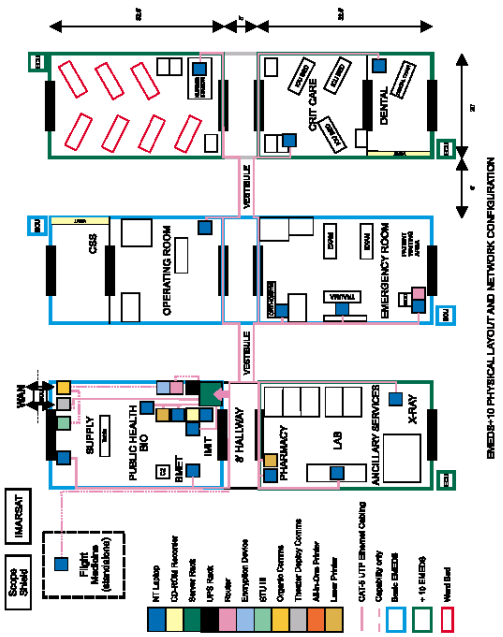
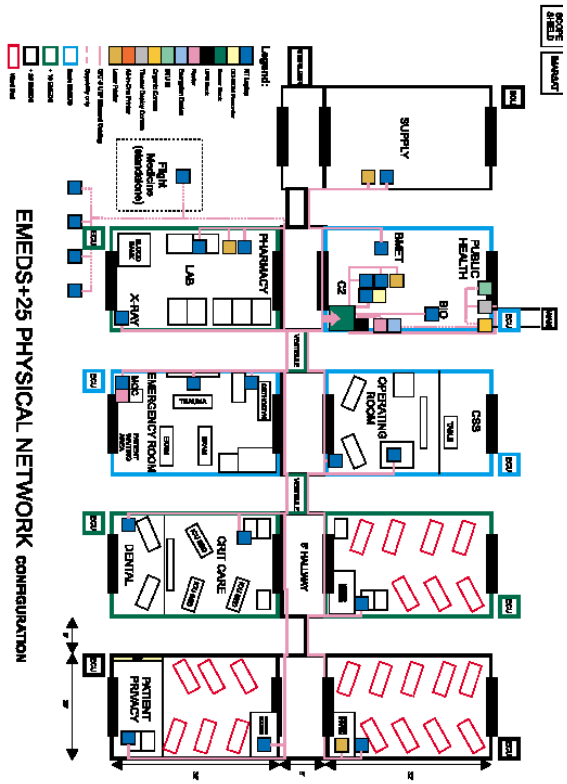
EMEDS +10 IM/IT Schematic

EMEDS +10 Facility Layout



EMEDS +25 IM/IT Schematic

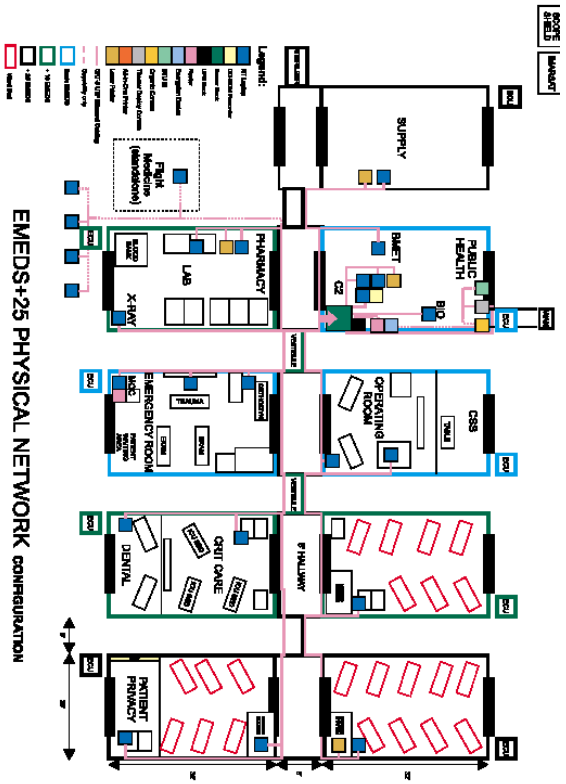
EMEDS +25 Facility Layout



If you need assistance with *EMEDS IM/IT*, Please call the EMEDS IM/IT Help Desk and open a work order.
The number is:
Commercial: (210) 587-2276
***1-888-380-9873**
(*only in the Continental United States)
Hours of Operation:
24 Hours/7 days a week
Or email:
gems.helpdesk@exp-med-sys.com

EMEDS +25 IM/IT Schematic

EMEDS +25 Facility Layout



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Chapter 8 Personnel by Section and Key Equipment

This chapter outlines the key personnel functioning within each tent and lists the key equipment assigned to that functional area. Because an equipment or supply item is not found within a specific functional area does not mean it is not available in another hospital location. EMEDS team members must stay aware of all equipment and supply resources found in the EMEDS medical facility.

TENT 1: Emergency Room/Lab/Pharmacy/X-ray

Key Personnel	Key Equipment/Supplies
Emergency Med Specialist	Llumisys Digital Radiography
Clinical Nurse	LifePak 12
Aerospace Med Specialist	Propaq 206EL
Aerospace Med (Fam Prac)	ISAT
Aeromed Svcs Journey	Litter Support
Aeromed Svcs Craft	Pharmacy Cabinets
Med Svcs Journey X 4	Portable Ultrasound
IDMT	Field Sink
	Refrigerator
	Thermopol Blood Refrigerator
	Medical Trauma Pack
	IV Infusion Pump
	Slit Lamp
	PT LOX
	Fluid Warming/Infusion

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IDMT	Field Sink
	Refrigerator
	Thermopol Blood Refrigerator
	Medical Trauma Pack
	IV Infusion Pump
	Slit Lamp
	PT LOX
	Fluid Warming/Infusion

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TENT 2: Operating Room/Central Sterile/Critical Card/Ward

Suggested Personnel	Key Equipment/Supplies
internist	Anesthesia Apparatus
Anesthesiologist	Propaq 206 EL
Orthopedic Surgeon	LifePak 12/Charger
General Surgeon	PT LOX
Critical Care Nurse	Field OR Table
OR Nurse	Dental Treatment Unit
Comprehensive Dentist	Portable Ventilator
Cardiopulmonary Lab Craftsman	Schick Digital X-ray Unit
	Eagle 10 Sterilizer
	Orthopedic Drill
	IVAC IV Infusion Pump
	Field Sink
	Ortho Fixation Unit
	Suction Unit
	Pulse Oximeter
	Dental Light
	Ortho Finger Traps
	Field Bed/Raven Litter
	Oxygen Sensor
	Medical Trauma Pack
	Air Driven Dental Unit
	Portable Dental X-Ray

TENT 3: Admin/PHO/BIO/BMET/Logistics

Suggested Personnel	Key Equipment/Supplies
Commander	IM/IT Equipment
Hlth Svcs Admin (MSC)	INMARSAT B
BEE	Radiac Set
Public Health Officer	Gas Monitor Dect.
Med Material Craft	Ethernet Hub
BMET	Digital Camera
	Optical Microscope
	Incubator Unit
	Navigation Set

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TENT 2: Operating Room/Central Sterile/Critical Card/Ward

Suggested Personnel
internist
Anesthesiologist
Orthopedic Surgeon
General Surgeon
Critical Care Nurse
OR Nurse
Comprehensive Dentist
Cardiopulmonary Lab Craftsman

Key Equipment/Supplies
Anesthesia Apparatus
Propaq 206 EL
LifePak 12/Charger
PT LOX
Field OR Table
Dental Treatment Unit
Portable Ventilator
Schick Digital X-ray Unit
Eagle 10 Sterilizer
Orthopedic Drill
IVAC IV Infusion Pump
Field Sink
Ortho Fixation Unit
Suction Unit
Pulse Oximeter
Dental Light
Ortho Finger Traps
Field Bed/Raven Litter
Oxygen Sensor
Medical Trauma Pack
Air Driven Dental Unit
Portable Dental X-Ray

TENT 3: Admin/PHO/BIO/BMET/Logistics

Suggested Personnel
Commander
Hlth Svcs Admin (MSC)
BEE
Public Health Officer
Med Material Craft
BMET

Key Equipment/Supplies
IM/IT Equipment
INMARSAT B
Radiac Set
Gas Monitor Dect.
Ethernet Hub
Digital Camera
Optical Microscope
Incubator Unit
Navigation Set

TENT 4: (EMEDS+10) Lab/Pharmacy/X-ray

Suggested Personnel	Key Equipment/Supplies
Pharmacy Craft	ISAT w/battery charger
Med Laboratory Craft	Optical Microscope
Radiology Craft	Field Table
	Gas Monitor Detection.
	Refrigerator
	Digital Camera
	Coagulation Timer Mechanical
	Freezer
	Coulter AT Trainer Reagent
	Dynac III Centrifuge
	Pharmacy Cabinet
	Bio-chem Incubator

TENT 5: (EMEDS+10) Critical Care Ward/Dental Unit

Suggested Personnel	Key Equipment/Supplies
Internist	Dental Treatment Unit
Critical Care Nurse x 3	Fluid Warming/Infusion
Cardiopulmonary Lab Craft	Propaq
Comprehensive Dentist	LifePak 12/Charger
Dental Craftsman	PT LOX
	Schick X-ray Unit
	Dental Treatment Unit
	Portable Vent
	Schick X-ray Unit
	Pulse Oximeter
	Air Driven Dental Unit
	IV Infusion Pump
	Portable Dental x-ray
	Dental Light
	Field Bed
	Suction Unit
	Dental Instu Stand
	Dental Stool
	Dental Chair
	Surg Head Light

TENT 4: (EMEDS+10) Lab/Pharmacy/X-ray

Suggested Personnel	Key Equipment/Supplies
Pharmacy Craft	ISAT w/battery charger
Med Laboratory Craft	Optical Microscope
Radiology Craft	Field Table
	Gas Monitor Detection.
	Refrigerator
	Digital Camera
	Coagulation Timer Mechanical
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	Coulter AT Trainer Reagent
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	Pharmacy Cabinet
	Bio-chem Incubator

TENT 5: (EMEDS+10) Critical Care Ward/Dental Unit

Suggested Personnel	Key Equipment/Supplies
Internist	Dental Treatment Unit
Critical Care Nurse x 3	Fluid Warming/Infusion
Cardiopulmonary Lab Craft	Propaq
Comprehensive Dentist	LifePak 12/Charger
Dental Craftsman	PT LOX
	Schick X-ray Unit
	Dental Treatment Unit
	Portable Vent
	Schick X-ray Unit
	Pulse Oximeter
	Air Driven Dental Unit
	IV Infusion Pump
	Portable Dental x-ray
	Dental Light
	Field Bed
	Suction Unit
	Dental Instu Stand
	Dental Stool
	Dental Chair
	Surg Head Light

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TENT 6: (EMEDS+10) Ward

Suggested Personnel	Key Equipment/Supplies
Clinical Nurse (O-4)	Field Bed
Clinical Nurse x 2	Raven Litter
Med Svcs Journey x 6	Patient Monitor(s)
Med Svcs Craftsman x 1	Lifepak 12
	PT LOX
	IV Infusion Pump
	Field Sink
	Suction Unit
	Food Blender
	Medicine Cabinet
	TV/VCR Combo
	Field Table
	Wheeled Litter carrier
	Port-a-potty

TENT 7: (EMEDS+25) Ward
TENT 8: (EMEDS+25) Ward

Addition of EMEDS +25 pallets adds holding bed capability to existing capabilities. More patient care personnel and holding bed capability is achieved.

TENT 9: (EMEDS+25) Supply

With the addition of the EMEDS +25 supply and logistic areas previously located in the back of tent 3 moves to tent 9. This move is in anticipation of increased demand for logistics capability with the increased patient care load associated with EMEDS +25.

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TENT 6: (EMEDS+10) Ward

Suggested Personnel
Clinical Nurse (O-4)
Clinical Nurse x 2
Med Svcs Journey x 6
Med Svcs Craftsman x 1

Key Equipment/Supplies
Field Bed
Raven Litter
Patient Monitor(s)
Lifepak 12
PT LOX
IV Infusion Pump
Field Sink
Suction Unit
Food Blender
Medicine Cabinet
TV/VCR Combo
Field Table
Wheeled Litter carrier
Port-a-potty

TENT 7: (EMEDS+25) Ward
TENT 8: (EMEDS+25) Ward

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CHAPTER 9 MEDICAL LOGISTICS

Medical logistics provides the supplies and equipment necessary for clinicians to provide healthcare in a deployed setting. In today's AEF environment, EMEDS/AFTH assets will initially deploy with sufficient medical supplies and equipment to operate for seven days. A 10-day resupply package has been developed to provide resupply capability. It is envisioned that when fully mature reachback capability is in place, maintenance of resupply packages will be no longer necessary. Communications and reachback using automated systems is crucial to supporting AEF. In addition, expeditionary combat support (ECS) will be required wherever EMEDS assets are deployed.

PESONNEL SUPPORT:
One 4A1X1 (logistics technician) and one 4A2X1 (biomedical maintenance technician) support the EMEDS basic. An additional 4A1XXXXXX1 provides support at the EMEDS +10 level. Finally, one additional 4A1X1 and one additional 4A2X1 compliments the logistics staff at the EMEDS +25. (Future plan is to move the 4A2X1 to the EMEDS +10) BMETs will deploy with issued personal tool kits. Sufficient spare parts and/or test equipment should be identified in the as for the EMEDS basic, EMEDS +10, and EMEDS +25 bed AFTHs. Additional BMETs consultation will be provided via teleconference, as needed. Equipment repairs beyond the capabilities of the BMETs will be managed by priority equipment replacement.

REACHBACK RESUPPLY SYSTEM:
Simply put, the loggie on the ground submits materiel requisitions via the Internet, e-mail, fax, or SATCOM back to a sustaining base. A sustaining medical treatment facility (MTF) will be designated for the contingency/operation. The sustaining MTF will process orders through MEDLOG and performs all necessary actions to acquire materiel. According to reachback supply concept, supplies are required at the aerial port of embarkation (APOEs) within 24-48 hours of receiving the requirement, at the sustaining base; and receipt at the deployed site with 24-48 hours of shipment from the (APOE). The "reachback" system relies heavily on air transport (rapid global mobility); reliable communication capability (agile combat support), and FFL0G (logistics teams) deployed along the supply chain to ensure positive control of medical items.

AUTOMATED INFORMATION SYSTEMS:
Medical logistics support will rely heavily on technology to support the resupply process. MEDLOG, an air force standard computer system, is up-to-date and functional, including the ability for data entry over the Internet from remote location. An effective in-transit visibility system is crucial to providing medical logistics support. Until the joint total asset visibility (JTAV) system is available in the future, plexus (a commercial off-the-shelf capability currently used to track patient movement items (PMI) will be adapted to provide total asset visibility for medical

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shipments. Plexus mobile computer-scanner software is presently on a palmtop PC platform and must be on the same laptop as smarter and other MEDLOG-capable information. All materiel, to include the initial response supplies, sustainment materiel, and medical equipment, will be managed using one of the following systems:
The MEDLOG computer system at the sustaining base using forward customer support procedures at the EMEDS/AFTH site; or a deployed mobile MEDLOG (MOMEDLOG) computer system at the EMEDS/AFTH site or the defense medical logistics standard support system (DMLSS); or a combination of these systems depending on the size and complexity of medical logistics support required by the EMEDS/AFTH deployment

ORDERING/RESUPPLY PROCESS:
When the deployed EMEDS/AFTH has Internet connectivity, identification of resupply and other supply/equipment requirements will be through the Internet and communicated to the sustaining base through an email interface from the EMEDS/AFTH. The resupply-ordering tool will have 100% text-based redundant messaging capability to ensure that communication failures do not cause the resupply system to fail.
When Internet capability is not available, phone, fax or any other means available will support the underlying processes. This concept introduces the use of single or multiple FFL0G UTCs (consisting of three 4a1x1s) at the sustaining base and at the designated aerial ports for the airlift. The FFL0G team receives the items, manifests them for airlift, and provides in-transit visibility data to both the sustaining base and the deployed medics. The number of FFL0G teams used to support resupply will be scaled to correspond with the ground footprint at the deployed location(s).
Complexities involved with acquiring the right items; the administrative tasks involved with bill paying and assigning/using responsibility centers/cost centers (RC/CCS) and emergency special project (ESP) codes; and record keeping/data collection for future deployments will be managed by medical logistics personnel at the sustaining base.
Key to the success of this sustainment concept is the use of experienced logisticians at the sustaining base and aerial ports. To round out support in the transportation chain, medical logisticians may be place at aerial ports of embarkation and/or debarkation (APOEs/APODs) with communications necessary to provide in-transit visibility for the sustaining base deployed personnel or other command and control elements.
Maintaining 100 percent positive control over the entire process ensures total asset visibility and the high degree of reliability required for deployed EMEDS/AFTH support. In cases where the requested item is unavailable, the sustaining base has the clinical expertise required to recommend similar items (suitable substitutes) on short notice to support the full range of peacetime and contingency missions.

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LONGTERM REACHBACK CONCEPT:
Future plans call for consolidation of medical logistics support from CONUS using a sustainment base together with a single government agency such as the navy's inter-service supply support operations program, or contractor to provide a single transportation consolidation point of contact for medical logistics support to deployed EMEDS/AFTH personnel. Until this occurs, there will be heavy reliance on the sustaining base and dedicated air transport for re-supply. A reachback capability will be established for both sustainment and new materiel. Line item requisitioning capability will commence within 24-48 hours upon arrival using the deployed AIS. Initial resupply efforts will be limited to identifying requirements and letting the acquisition, sourcing, and follow-up be done at the sustaining base. Sustaining base sources for materiel include current inventory, centrally stored resupply sets, the defense logistics agency (DLA), inter-theater, local purchase using IMPAC government credit card, veterans administration and other acquisition tools.

Section Codes Used for EMEDS Allowance Standard

SECTION	FAC
A -	FAC: 5224 Emergency Room/Triage
C -	FAC: 5220 Critical Care
B -	FAC: 5310 ADVON
E -	FAC: 5513 Pharmacy
F -	FAC: 5512 Laboratory
G -	FAC: 5515 Radiology
H -	FAC: 5310 Flight Medicine
I -	FAC: 4580 Communications / Systems
J -	FAC: 5560 Administration
K -	FAC: 5530 Logistics
L -	FAC: 5530 Medical Maintenance
N-	FAC: 5520 Nutritional Medicine
M -	FAC: 5530 Housekeeping
P -	FAC: 5240 Anesthesia
Q -	FAC: 5240 Surgery / Operating Room
R -	FAC: 5240 Central Sterile Supply
S -	FAC: 5219 Ward
U -	FAC: 5421 Dental
V -	FAC: 5311/5313 Bioenvironmental / Public Health
W -	FAC: 5530 Facility Management
X-	FAC: 5211 Physical Therapy

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CHAPTER 10 SURGICAL SERVICES

Operating Room /Central Sterile Supply: The EMEDS/AFTH initial force package (EMEDS Basic) OR/CSS develops over the 2nd and 3rd modules of the 1st AFTH increments. The first
element of surgical capability is found in module 2 with the arrival of the Mobile Field Surgical Team (MFST). This is a 5 member surgical team that is tasked with providing emergency medical and surgical trauma care for the AEF first deployers. Once this team arrives on site and locates a shelter of opportunity, they are able to achieve initial operational capability (IOC) within 15 minutes using the self contained surgical package that they carry in backpacks. Within 24 hours of the arrival of module 2, the remaining EMEDS Basic package and personnel arrive (Module 3). Full Operational Capability (FOC) should be established within 12 hours.
Surgical capability for EMEDS Basic is limited to performing 10 major surgeries or 20 non-operative / Advanced Trauma Life Support (ATLS) resuscitations in a 24 hour period. The one OR table, supplies and equipment will sustain this tempo only once in the initial 7-day period before resupply arrives.

Surgical scope of care is directed towards operative damage control procedures. That is, stabilize the patient for evacuation only. No definitive care, this will be accomplished at a higher echelon. Damage control includes major thoracic and abdominal procedures, maxilla-facial procedures and anesthesia. The goal of medical/surgical care at this level is PATIENT STABILIZATION i.e. airway secured, hemorrhage controlled, shock controlled and fractures stabilized. Blood supply is short and limited to type O-Negative.

With the arrival of EMEDS +10, surgical capabilities remain the same. However, limited general and orthopedic non-urgent procedures may be performed as needed. 10-bed patient holding is available.

EMEDS +25 increases the surgical capability to performing 20 major surgeries or 20 non-operative trauma resuscitations in a 72-hour period. Two OR tables, supplies and equipment will sustain this tempo only once in the 7-day period before resupply arrives. Sustained surgical capability is obtained using one OR table with the second table held for disaster response.
Central Sterile Supply capabilities increase with each new increment. EMEDS Basic (module 2) allows for only cold chemical sterilization as needed with no sterile storage capabilities. Module 3 brings in the Eagle 10 tabletop sterilizer allowing for surgical sterilization of instruments as needed and limited storage of sterile items. EMEDS +10 increases the ability to surgically sterilize instrument sets and linen packs using the 2151 Field Sterilizer. Hard case sterile storage containers, paper and linen sterilization wrappers and the ability to monitor the effectiveness of the sterilization process using chemical and biological markers significantly improves

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the quality of patient care. EMEDS+25 increases the decontamination abilities with the introduction of an ultrasonic cleaner to remove gross contaminate that may be hidden within the surgical instruments. CSS capabilities are limited due to austere field conditions where regulation of the "sterile" environment is nearly impossible.

Surgical Staffing: Surgical staffing is maintained by the original 5 man MFST until EMEDS +25 with the exception of one surgical services journeyman at EMEDS +10. MFST personnel consist of an Emergency Room physician, a General surgeon, an Orthopedic surgeon, an Anesthesiologist or Certified Registered Nurse Anesthetist (CRNA) and an OR nurse. Each member of this team is cross-trained and available to assist in providing primary care as needed. EMEDS +25 increases the staffing by adding another General surgeon, OR nurse, an anesthesia provider (MD or CRNA) and 2 additional surgical service journeymen.

OR / CSS Configuration: EMEDS Basic configuration requires that 1 of the 3 Alaska tents share OR/CSS and Critical Care bed space. This is accomplished by the use of a linen or vinyl wall that is erected near the center of the tent. This wall is secured to the interior framework of the Alaska tent and contains two clear plastic window and a zippered door. This allows the OR/CSS areas to be isolated from the rest of the hospital and decreases traffic movement through the clean surgical area.

Placement of the OR table is at the discretion of the OR team. Keep in mind the traffic flow (movement of the litter team and supplies), lighting, electrical outlet availability and environmental control unit (ECU) intake and exhaust ducts. Also remember to route waste anesthesia gases outside the tent and AWAY from the ESU intake.

During EMEDS Basic you will find the OR/CSS to be less than optimal for space. Remember that in addition to performing surgery, you will also be storing equipment, backpacks, instrumentation and supplies in this area. Additionally, you will need space to clean and decontaminate your instruments. This can be accomplished by stacking nesting boxes in a corner of the OR and using this as a work area between cases. If the tactical/environmental situation allows, move the DECON out the rear of the OR tent and use inside areas for chemical sterilizing and rinsing of the instruments.

EMEDS +10: With the arrival of the EMEDS +10 package, the Critical Care Beds move out to their own area. The OR will then expand leaving the CSS in the same area and the OR moving to the area vacated by Critical Care. Again set up is at the OR staffs discretion.

EMEDS +25: The extra OR bed in the +25 package is placed it the same area with the original OR bed. Since this bed is for disaster response, it is not necessary to allot equal space at this time. Maintain the majority of space for the area around the OR bed that will be utilized the most. However, keep in mind that in a disaster response the second OR bed must be easily available.

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EMEDS BASIC SURGICAL EQUIPMENT

The first surgical equipment package arrives with the MFST. This package consist of:

- A small portable electrocautery unit (Valleylab Bovie). Self-explanatory setup with manual controls. Requires disposable ground pad and electrocautery pencil and 110V electricity.
- A small portable battery/110V portable suction unit. Hard wall suction canisters will be cleaned and reused until resupply arrives. Uses disposable suction tubing and Yaunker suction tip. * Hint: Turn off suction when not in use, motor overheats resulting in substantial decrease in suction.
- Propaq vital signs monitor with Cappnography (?) capability. Battery/110V portable monitor. Used by anesthesia provider.
- Draw over Anesthesia vaporizer. Manual does not require supplemental O2 or electricity. Used by anesthesia provider.
- Basic surgical instrument sets X 2. Consist of basic general and vascular instrumentation along with selected hand held retractors. Ortho instrument set. Consist of basic Ortho specific instruments required to place external fixation devices and perform minor surgeries/amputations.
- Modified Chest tube/Tracheotomy set. Basic instruments to perform an emergency chest tube placement or tracheotomy. Vascular Balfor retractor and Finichetto rib retractor individually wrapped.
- External fixation devices. Hoffan II set contains all needed equipment to place an external fixation device in the field setting (disposable).
- A-33 Chemical disinfectant. Water-soluble packet for DECON and disinfecting surgical instruments in the absence of a surgical sterilizer.
- Sonosite Portable Ultrasound Machine

The 3rd module of the EMEDS Basic package provides:

- Versipower drill/saw and power box. Requires 110V
- 9Volt handheld drill, batteries and charging apparatus
- OR field surgical table. This table comes complete with lights, arm boards and IV poles. 2 side rail adapters shipped separately. Holds a standard NATO litter with surgical patient. Refer to assembly instructions in storage container
- Eagle 10 sterilizer. Requires 120V Computer processor with printer for documentation of sterilizing parameters. Comes with extra rolls of printer tape. Uses a sterilizing pan shipped separately. Additional info can be
- obtained through Medical Maintenance or Steris Corporation 800-925-3513
- Field surgical scrub sink. Manual or 110V. Requires water source (5 gallon
- Gerry can or direct waterline) and a wastewater collection point (5 gallon Gerry can LABELED:"WASTE WATER ONLY" or an appropriate drainage system).
- Liquid Oxygen Converter (LOX) box. Provides an oxygen source in the absence of oxygen tanks.

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- Liquid Oxygen Converter (LOX) box. Provides an oxygen source in the absence of oxygen tanks.

- IV fluid warmer/ rapid infuser. Used to warm and rapidly infuse IV fluids.

Primary care is performed by the OR nurse/tech with the assistance of the ward or ER/ICU personnel. Preoperative patients will be held in the ER/ICU or ward depending on how stable the patient is until the OR is prepped and ready for surgery.

Prior to or during surgery, complete the following required forms. (except disaster response cases:)

- SF600 Chronological Record of Medical Care
- SF222 Patient Consent Form
- SF517 Anesthesia Medical Record

These records will accompany the patient to the OR. All items of clothing/jewelry should be removed prior to surgery and personal items bagged and labeled with the patient's name, date and SSN.

The patient transport detail or available healthcare personnel provide transport of non-ambulatory patients to the OR. The MD or anesthesia provider may escort ambulatory patients to the OR if appropriate. Check with the Operations Officer for the availability of an extra person to assist in the OR during the case.

Post-OP: Approximately 15 to 30 minutes before the completion of the surgical procedure a report to the gaining ward/ICU will be given via phone or in person by a member of the surgical staff. Shortly before the surgical patient is ready for transport to the ward/ICU, the Operations Officer will be notified by OR staff etc that a transports team is needed. This team will transport the post-op surgical patient (on the surgical litter) to the receiving ward/ICU. Document surgery in a surgical log and ensure all paperwork is returned with the patient.

DECON: After each case, wipe down all equipment with A-33 solution or available disinfectant. Mop or Wet Vac area around OR bed if a case is to immediately follow. Mop or Wet Vac entire OR floor if last case. All contaminated waste (solid / liquid) and sharps will be collected and disposed of as directed by hospital policy.

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- IV fluid warmer/ rapid infuser. Used to warm and rapidly infuse IV fluids.

Primary care is performed by the OR nurse/tech with the assistance of the ward or ER/ICU personnel. Preoperative patients will be held in the ER/ICU or ward depending on how stable the patient is until the OR is prepped and ready for surgery.

Prior to or during surgery, complete the following required forms. (except disaster response cases:)

- SF600 Chronological Record of Medical Care
- SF222 Patient Consent Form
- SF517 Anesthesia Medical Record

These records will accompany the patient to the OR. All items of clothing/jewelry should be removed prior to surgery and personal items bagged and labeled with the patient's name, date and SSN.

The patient transport detail or available healthcare personnel provide transport of non-ambulatory patients to the OR. The MD or anesthesia provider may escort ambulatory patients to the OR if appropriate. Check with the Operations Officer for the availability of an extra person to assist in the OR during the case.

Post-OP: Approximately 15 to 30 minutes before the completion of the surgical procedure a report to the gaining ward/ICU will be given via phone or in person by a member of the surgical staff. Shortly before the surgical patient is ready for transport to the ward/ICU, the Operations Officer will be notified by OR staff etc that a transports team is needed. This team will transport the post-op surgical patient (on the surgical litter) to the receiving ward/ICU. Document surgery in a surgical log and ensure all paperwork is returned with the patient.

DECON: After each case, wipe down all equipment with A-33 solution or available disinfectant. Mop or Wet Vac area around OR bed if a case is to immediately follow. Mop or Wet Vac entire OR floor if last case. All contaminated waste (solid / liquid) and sharps will be collected and disposed of as directed by hospital policy.

EMEDS Basic

Module 2: A-33 is the chemical disinfectant used for processing all instrumentation at this level.

Module 3: The Eagle 10 sterilizer is available. Use and limitations on size of instruments, types of materials and sterilization time are found in the manufacture's guide packed with the equipment.

EMEDS +10

The ability to sterilize and monitor the sterilization process is greatly enhanced with the arrival of this package. Items available include:

- Hard shell sterilizing/storage containers for instrument sets
- Includes paper filters, tamper indicator arrows and identification tags
- Paper and linen wrappers for instruments
- Integrator strips
- Sterilizing tape
- Plastic envelopes/bags (dust covers)
- Biological incubator and biological indicators
- Omnicide and soaking tray for scopes/ oversize instruments
- 2151 Field sterilizer with water recovery unit. Wet Vacuum
- Field sink

EMEDS +25

- Sporox liquid
- Ultrasonic cleaner

Develop a plan to receive, track, process and have available for pickup contaminated instruments from the ER/wards. Remember traffic control, keep contaminated items separate from clean/sterile areas. Wards/ER is responsible for delivery and pickup of their instrumentation.

Initial Inventory: OR equipment/instrumentation may arrive from the factory without having been processed through medical maintenance. Check over all equipment for accessories, literature and function. Instruments may arrive individually packaged. Many items have a protective coating that must be removed before processing.

IMPORTANT: BEFORE unwrapping instruments, separate all instruments into their respective instrument sets. This will facilitate identification of the instruments and save you a lot of time and frustration. Once all sets are together and inventoried, then remove instruments from their wrappers, clean, package and sterilize.
If items are missing, check with logistics, if the items were received, they may still have them or they were sent to the ward/ER by mistake.

EMEDS Basic

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If items are missing, check with logistics, if the items were received, they may still have them or they were sent to the ward/ER by mistake.

Storage of Equipment:

EMEDS Basic:

- Module 2) MFST backpacks, shelves of opportunity, nesting boxes, plastic crates etc. Must be able to be cleaned.
- Module 3) Same as module 2 but with folding table.

EMEDS +10 & +25

- Anesthesia cart, Push cart, wire shelves, folding table and nesting boxes. A large plastic shipping container may be utilized as a table for processing in CSS.
- Sterilized items may be stored in hard containers or paper /linen wrapped and sealed in plastic dust cover.
- REMEMBER to store all equipment and sterile supplies in areas away from moisture and excessive dust.

Communication: OR is allotted a laptop computer. This is to stay in the surgical suite at all times. Software TBA. May be used to view x-rays, telemedicine, spreadsheets, inventory, schedules and e-mail. All rules/regulations for government computer use remain in effect. Qualified personnel will give computer instruction.

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EMEDS Basic:

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Location and Quantity of Surgical Trays

Set	DEPMED #	EMEDS+10 Bed AFTH	EMEDS+25 Bed AFTH	EMEDS+ 10 + EMEDS+ 25
Major Basic	T001	1	1	2
Minor Procedure	T004	2	2	4
Intestinal	T007	1	0	1
Anal/Rectal	T009	1	0	1
Vascular	T011	1	0	1
Throcotomy	T012	0	1	1
D&C	T031	1	0	1
Basic Ortho Instruments	T032	1	1	2
K-Wire/Steinmann Pin	T033	0	1	1
Amputation	T034	0	1	1
Soft Tissue Hand/Tendon/Foot	T035	0	1	1
Surgical Prep Set	T052	2	2	4
Basin Set	T053	2	2	4
Large Retractor Tray	T060	1	1	2
	Total:	13	13	26

Location and Quantity of Surgical Trays

Set	DEPMED #	EMEDS+10 Bed AFTH	EMEDS+25 Bed AFTH	EMEDS+ 10 + EMEDS+ 25
Major Basic	T001	1	1	2
Minor Procedure	T004	2	2	4
Intestinal	T007	1	0	1
Anal/Rectal	T009	1	0	1
Vascular	T011	1	0	1
Throcotomy	T012	0	1	1
D&C	T031	1	0	1
Basic Ortho Instruments	T032	1	1	2
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Instructions for downloading surgical trays and components from the Universal Data Repository (UDR) into an EXCEL spreadsheet. The UDR will either be loaded on a shared drive through the LAN or available on (2) CDs in Medical Logistics.

Step 1. Once setup of UDR is complete, open the program and double click on the button with the red cross on "DEPMEDs Search"

Step 2. Click on "Tray" in type box

Step 4. Highlight the Tray number and click search-DEPMEDS Component Summary screen will appear

Step 5. Click on "file" then "print"-

Step 6. When print options screen appears click "print to file" and ok. The 'Save as' screen will appear.

Step 7. Save the file in directory of your choosing (recommend naming the file the number of the tray and description -i.e. T001Major Basic w/Large Retractor)

Step 8. Open Microsoft Excel-find the file in the applicable directory. Since the file was saved as a text file, change the file type using the drop-down box to All Files or Text Files. Double click on the file or highlight and click open.

Step 9. Text Import Wizard screen will appear
-Step 1 of 3 will appear. Ensure "fixed width" is selected-click "next"-
-Step 2 of 3 will appear-click "next"
-Step 3 of 3 will appear-click "text" in column data format-click finish

Step 10. Save file and adjust the spreadsheet as needed. Repeat each step for each tray to be downloaded.

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Step 10. Save file and adjust the spreadsheet as needed. Repeat each step for each tray to be downloaded.

EMEDS Basic--Laboratory Capability	
I-Stat Analytes E(7+Cartridge	NA, K, CL, Ionized Calcium, pH, PC02, PO2, Hct, HC03, TC02, BE, sO2, Hb
Urine Based Analyses	BHCG, Urine, SENS To 20mlu Urine Drug Screen: Qualitative for PCP BENZO, COC, AMP, THC, OPI, BARB, TCA (Tricyclic Antidepressants) Simple Self-Contained Biosite Kit Urine or Saliva Ethyl Alcohol: Qualitative Kit Urinalysis, (Macroscopic Only, No Centrifuge)
Cardiac Analyses	Cardiac Troponin I ; CK-MB And Myoglobin
Miscellaneous Analyses	KOH Preps, Direct Preps Occult Blood Monospots D-Dimer

Chapter 11 Laboratory Capabilities

EMEDS Basic--Laboratory Capability	
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Cardiac Analyses	Cardiac Troponin I ; CK-MB And Myoglobin
Miscellaneous Analyses	KOH Preps, Direct Preps Occult Blood Monospots D-Dimer

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EMEDS+10 Bed AFTH Laboratory Capability	
I-Stat Analytes EG 7+ cartridge **6+ cartridge**	NA, K, CL, BUN, GLU, pH, PC02, PO2, HC03, TC02, HCT, Ionized Calcium, BE, sO2, Hb
Urine Based Analyses	BHCG, Urine, SENS to 20mlu Urine Drug Screen: Qualitative for PCP BENZO, COC, AMP, THC, OPI, BARB, TCA (Tricyclic Antidepressants) Simple Self-Contained BIOSITE Kit Urine or Saliva Ethyl Alcohol: Qualitative Kit Urinalysis; Microscopic and Macroscopic
Cardiac Analyses	Cardiac Troponin I ; CK-MB and Myoglobin
Full Blood Banking Capability	ABO/Rh, Antibody Screens, Crossmatch, FFP Storage and Thawing, 30 Units PRBCs (Type Specific) Emergency Whole Blood Drawn
Complete Blood Count	Automated WBC, RBC, HCT, PLT, Indices, LYMPH %, ABSOLUTE # LYMPHS, DIFFERENTIAL (Manual If Indicated), Hgb, MCV, MCH, MCHC; Reticulocytes
Coagulation Tests MLA-750	PT and PTT
Miscellaneous Analyses	Fibrin Degradation Products/D-Dimer (from EMEDS Basic) Koh Preps, Direct Preps Occult Blood Monospots Malaria, Thick and Thin Smears Grams Stain Cell Counts, CSF, Other Fluids and Aspirates

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I-Stat Analytes EG 7+ cartridge **6+ cartridge**	NA, K, CL, BUN, GLU, pH, PC02, PO2, HC03, TC02, HCT, Ionized Calcium, BE, sO2, Hb
Urine Based Analyses	BHCG, Urine, SENS to 20mlu Urine Drug Screen: Qualitative for PCP BENZO, COC, AMP, THC, OPI, BARB, TCA (Tricyclic Antidepressants) Simple Self-Contained BIOSITE Kit Urine or Saliva Ethyl Alcohol: Qualitative Kit Urinalysis; Microscopic and Macroscopic
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EMEDS +25 Laboratory Capabilities	
Microbiology	Throat, Urine, Wound, Blood, Skin, Stool, Sputum, Urethral, Eye, Nasal and Cerebrospinal Fluid Cultures Are Provided; Basic Identification and Sensitivities Ova and Parasitic Concentration and ID/Trichrome Staining for Protozoa Anaerobic Culture; Very Basic; Growth and Grams Stain, No ID
Abaxis Piccolo Chemistry Anayzer	Alk Phos, Alt, Ast, Amy, Alb, Tp, Tbil, Bun, Creat, Ca, Chol, Gluc, Uric Acid
Cardiac Analyses	Cardiac Troponin I ; Ck-MB And Myoglobin
Complete Blood Count	Automated Wbc, Rbc, Hct, Plt, Indices, Lymph %, Absolute # Lymphs, Differential (Manual If Indicated), Hgb, MCV, MCH, MCHC; Reticulocytes
Coagulation Tests MLA-750	PT, PTT
Urine Based Analyses	BHCG, Urine, SENS to 20mlu Urine Drug Screen: Qualitative for PCP Benzo, COC, AMP, THC, OPI, BARB, TCA (Tricyclic Antidepressants) Simple Self-Contained Biosite Kit Urine or Saliva Ethyl Alcohol: Qualitative Kit Urinalysis; Microscopic And Macroscopic
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Ancillary Laboratory Specialty Set	
Chemistry Analyses/Toxicology: Johnson and Johnson Vitros 250	Sodium, Potassium, Chloride, ECO2, Total Bilirubin, Direct Bilirubin, Quant CK-MB, Cholinestererase, Magnesium, Ammonia, Urine Protein, CSF Glucose,CSF Protein, Uric Acid, Total Protein, Albumin, Alkaline Phosphatase, ALT, AST, Bun, Calcium, Glucose, Uric Acid, Amylase, Creatine, Dilantin (Phenytoin), Digoxin, Theophylline, Salicylates, Quant Alcohol, Acetominophen
Therapeutic Drugs/; Abbott TDx/FLx	Gentamycin, Amikacin, Lidocaine, Procainamide, NAPA, Phenobarbitol
Miscellaneous Test Kit	Group A Streptococcus Determination Meningitis Determination

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Ancillary Laboratory Specialty Set	
Chemistry Analyses/Toxicology: Johnson and Johnson Vitros 250	Sodium, Potassium, Chloride, ECO2, Total Bilirubin, Direct Bilirubin, Quant CK-MB, Cholinestererase, Magnesium, Ammonia, Urine Protein, CSF Glucose,CSF Protein, Uric Acid, Total Protein, Albumin, Alkaline Phosphatase, ALT, AST, Bun, Calcium, Glucose, Uric Acid, Amylase, Creatine, Dilantin (Phenytoin), Digoxin, Theophylline, Salicylates, Quant Alcohol, Acetominophen
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Miscellaneous Test Kits	Group A Streptococcus Determination Meningitis Determination

APPENDIX I
Selected Equipment Instruction

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Selected Equipment Instruction

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(PTLOX)
Converter Portable Therapeutic Liquid Oxygen System

Purpose. The PTLOX is designed to provide controlled flow of humidified oxygen to as many as three (3) oxygen outlets when an aircraft oxygen source is unavailable.

Description. The PTLOX is comprised of the container assembly and accessory kit assembly. The container assembly consists of three (3) gaseous oxygen outlets, a liquid oxygen filler port, and a liquid oxygen quantity gauge (used for filling and monitoring quantities of liquid oxygen stored in the unit). An accessory kit assembly that attaches to the liquid oxygen, oxygen unit contains the following: oxygen hoses, flow control valves, and humidification units for distributing oxygen from the converter. Oxygen is delivered to the converter outlets at a pre-set pressure of 50 +/- 5 pounds per square inch (psi), and a maximum flowrate of 15 liters per minute (LPM) per outlet. A pressure gauge continuously registers oxygen delivery pressure. Include maximum liter oxygen (O2) flow if Minilator used, i.e., 60 LPM O2 flow.

WARNING: Keep the PTLOX System away from fires. Place a minimum of 50 feet from all sparking or flammable devices. Per Air Force Instruction (AFI) 21-101, *Maintenance Management of Aircraft*, maintenance and filling of LOX systems will be done only by qualified LOX personnel. Per AFM 161-30, Volume 1, *Solid Rocket/Propellants*, and AFM 161-30, Volume 2, *Liquid Propellants,* handling and storage of this unit will be the responsibility of qualified LOX personnel. Never allow the converter to be placed where the vent may be obstructed. The vent line and fitting must remain open at all times.

NOTE: The PTLOX System vents oxygen when the system is not being used, and a low hissing sound may be heard. The maximum venting rate is 1 liter of liquid oxygen per 24 hours.

Components. The PTLOX unit accessory case contains:
Three (3) twenty foot low pressure oxygen hoses.

Three (3) flow control valves with securing clips and hook/pile straps.

Three (3) humidifier units.

Inspect the system for any signs of damage. Ensure the carrying handles and securing straps are in place and are securely attached to the unit. Open the accessory case, inventory the components and inspect them for serviceability. Ensure the sterile water has not expired. Check the structural soundness and function of the accessory case securing latches

Remove the accessory case from the liquid oxygen unit. Determine the liquid oxygen quantity by depressing the quantity switch and observing the digital display for the liters of liquid oxygen present. The quantity will be between 0.00 liters and 10.00 liters. Ensure the quantity is sufficient for the mission. Check the pressure gauge for proper operating pressure (50 +/- 5 psi).

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Check the battery condition by depressing the battery test switch. The digital display should show between 10.00 and 19.99. If not, replace the batteries with 9 volt batteries. Open the outlet cover panel by sliding it back, and check the outlets for any indication of damage, then close the outlet cover panel.

Assembly and Operation.

WARNING: DO NOT wear gloves when connecting oxygen lines.

WARNING: Never place the system where it will come in contact with petroleum products as fire or explosion may result

CAUTION: **DO NOT** connect Schrader adapter to outlets if PTLOX is prepared with nitrogen. This will bleed off pressure and potentially ruin unit.

CAUTION: The PTLOX System is to be positioned facing upward and never on its side.

WARNING: If any odors other than the hose smell are detected, have other personnel recheck it for odors. Contact the aircraft environmental systems personnel as soon as possible and report this incident. Do not use this unit! Replace it.

Secure the PTLOX System at the desired location with the tie down straps on the sides. Remove the accessory case, and open it. Remove a flow control valve, for each patient requiring oxygen, and secure the valve to the litter support strap near the heads of the patients. Attach the clip assembly to a litter support strap or seat strap (figure 3.1).. Remove the dust caps from the inlet and outlet of the flow control valve and secure in the accessory case. . Remove an oxygen hose storage reel from the accessory case and remove the hose from the reel. Connect the threaded end of the hose to the inlet on the side of the flow control valve, and ensure the valve is set to 0 LPM. Slide the oxygen outlet cover back until it is secure. Remove the outlet cap by twisting the knurled knob at the outlet in a clockwise direction. Insert the Schrader end (tapered) of the oxygen hose into the oxygen outlet and press firmly till it attaches securely. Turn flow control valve to highest setting and allow oxygen to flow for 20 seconds to purge the system. Smell the emitted oxygen for any odors. Return setting to 0 LPM. Remove a humidification bottle from the accessory case, and fill bottle with sterile water, as required. Attach humidification bottle to the bottom outlet of the flow control valve. Secure the bottle to the litter support strap by wrapping the hook and pile strap on the flow control valve around the bottle and litter support strap. Set the flow control valve to the prescribed flow rate, and ensure there is flow from the humidifier. Place the delivery device on the patient

WARNING: A flow control valve, with index set at zero (0) must be attached to the supply hose outlet fitting prior to inserting the supply hose disconnect into the container assembly supply receptacle. This procedure is imperative to prevent 50 psi oxygen from escaping out an open hose.

WARNING: Always connect the flow control valve fitting marked "OUTLET" to the humidifier. Reverse connection or use of a GAS source other than 50 ± 5 psi oxygen may result in inaccurate flow rates.

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Check the battery condition by depressing the battery test switch. The digital display should show between 10.00 and 19.99. If not, replace the batteries with 9 volt batteries. Open the outlet cover panel by sliding it back, and check the outlets for any indication of damage, then close the outlet cover panel.

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WARNING: Always connect the flow control valve fitting marked "OUTLET" to the humidifier. Reverse connection or use of a GAS source other than 50 ± 5 psi oxygen may result in inaccurate flow rates.

Operating time may be calculated in two ways:

If 15 LPM is being used, table 3.1 will provide the duration of time the system will operate for 1, 2, or 3 patients, with various quantities of oxygen in the system.

NOTE: The PTLOX System will provide a MAXIMUM flow rate of 15 LPM per outlet.

Multiply the total LPM by 60 by each hour of scheduled mission time to ascertain the total liters of gaseous oxygen required. Divide this total by 804 (i.e. 25 LPM x 60 x 4 hours/804 = 7.5 liquid).

NOTE: The PTLOX System will vent when not in use. Table 3.2 shows liquid oxygen remaining after each 24 hour period after being filled to 10 liters.

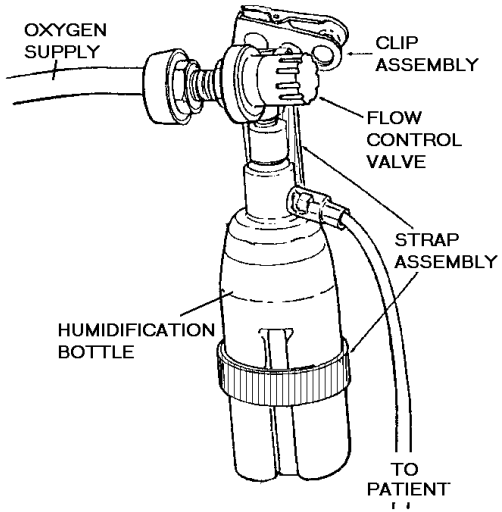

Figure 3.1. Hookup of Control Valve/Clip Assembly Humidification Kit and Oxygen Hoses

Operating time may be calculated in two ways:

If 15 LPM is being used, table 3.1 will provide the duration of time the system will operate for 1, 2, or
with various quantities of oxygen in the system.

NOTE: The PTLOX System will provide a MAXIMUM flow rate of 15 LPM per outlet.

Multiply the total LPM by 60 by each hour of scheduled mission time to ascertain the total liters of gas
required. Divide this total by 804 (i.e. 25 LPM x 60 x 4 hours/804 = 7.5 liquid).

NOTE: The PTLOX System will vent when not in use. Table 3.2 shows liquid oxygen remaining afte
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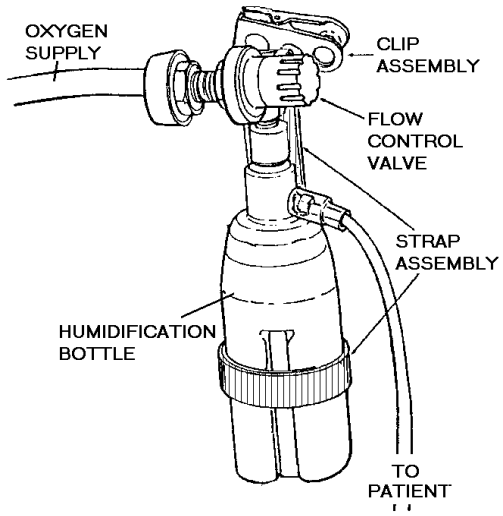

Figure 3.1. Hookup of Control Valve/Clip Assembly Humidification Kit and Oxygen Hoses

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Table 3.2. Converter Loss During Standby

Time After Filling (In Hours)	Liquid Oxygen Remaining (In Liters)
24	9.1
48	7.9
72	6.6
96	5.3

Table 3.1. Duration of Remaining Oxygen Supply in Minutes

Liters of Lox	Equivalent Liters of Gaseous Oxygen	with 1 Patient	with 2 Patients	with 3 Patients
10.0	8040	536	268	178
9.5	7638	509	254	169
9.0	7236	482	241	160
8.5	6834	455	227	151
8.0	6432	428	214	142
7.5	6030	402	201	134
7.0	5628	375	187	125
6.5	5226	348	174	116
6.0	4824	321	160	107
5.5	4422	294	147	98
5.0	4020	268	134	89
4.5	3618	241	120	80
4.0	3216	214	107	71
3.5	2814	187	93	62
3.0	2412	160	80	53
2.5	2010	134	67	44
2.0	1608	107	53	35
1.5	1206	80	40	26
1.0	804	53	26	17
0.5	402	26	13	8

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0.5	402	26	13	8

MINILATOR Oxygen Distribution Device

Purpose. The Minilator is a manifold system designed to provide therapeutic oxygen for up to five (5) patients from a single oxygen source.

WARNING: The Minilator was not designed for and should not be used to support ventilatory devices. Connect a separate oxygen hose from an approved oxygen source to operate ventilators.

NOTE: The oxygen flow control valve from the PTLOX system accessory kit may be used with the Minilator when connected to the Minilator OUTLET valves..

Description. The Minilator is an oxygen distribution system with one (1) inlet which is connected to the oxygen source, and a manifold with five (5) outlets for distributing oxygen (figure 3.2). Check valves are installed in the outlets to prevent oxygen flow from any unused outlets. Dust covers are installed to prevent debris from entering the Minilator. A connector is used to connect the oxygen delivery hose to the Minilator inlet.

Pre-flight. Inspect the manifold and connector for damage or obvious contamination.

Assembly and Operation.
Connect standard low pressure oxygen hose from a Veriflow regulator to the connector, and the connector to the appropriate Minilator inlet valve. If using the C-17 therapeutic oxygen system, connect the standard low pressure oxygen hose from C-17 therapeutic outlet to the connector and the connector to the appropriate Minilator inlet.. Remove the necessary dust caps from the outlet valves, and connect standard low pressure oxygen hoses to the outlets. Use oxygen flow to clear the lines of any contaminants. Connect the low pressure hoses to flowmeter/humidifier assemblies and purge the system with low flow oxygen, then set the flow rates to the prescribed values.

When using the PTLOX as an oxygen source, connect the low pressure hose to the appropriate Minilator inlet. Remove the necessary dust caps from the outlet valves. Either connect a low pressure oxygen hose to the most distal Minilator outlet from the Minilator inlet valve, and then connect the other end of hose to a PTLOX flow control valve, or connect the flow control valve directly to the most distal Minilator outlet. Ensure flow control valve setting is at zero (0). Then connect the low pressure hose to the PTLOX system. Purge system to clear the lines of any contaminants and return setting to zero (0). Attach humidifier assemblies as required and set the flow rates to the prescribed values.

WARNING: A Flow control valve, with index set at zero (0) must be attached to the most distal Minilator outlet valve from the Minilator inlet valve prior to connecting low pressure

Disassembly and Storage. Turn off the oxygen source to the Minilator. Disconnect the hoses from the Minilator outlets and replace the dust caps. Disconnect the hose from the Minilator inlet or connector, and remove the connector from the inlet. Replace the dust cap. Store the Minilator and connector, if applicable.

MINILATOR Oxygen Distribution Device

Purpose. The Minilator is a manifold system designed to provide therapeutic oxygen for up to five (5) patients from a single oxygen source.

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Pre-flight. Inspect the manifold and connector for damage or obvious contamination.

Assembly and Operation.
Connect standard low pressure oxygen hose from a Veriflow regulator to the connector, and the connector to the appropriate Minilator inlet valve. If using the C-17 therapeutic oxygen system, connect the standard low pressure oxygen hose from C-17 therapeutic outlet to the connector and the connector to the appropriate Minilator inlet.. Remove the necessary dust caps from the outlet valves, and connect standard low pressure oxygen hoses to the outlets. Use oxygen flow to clear the lines of any contaminants. Connect the low pressure hoses to flowmeter/humidifier assemblies and purge the system with low flow oxygen, then set the flow rates to the prescribed values.

When using the PTLOX as an oxygen source, connect the low pressure hose to the appropriate Minilator inlet. Remove the necessary dust caps from the outlet valves. Either connect a low pressure oxygen hose to the most distal Minilator outlet from the Minilator inlet valve, and then connect the other end of hose to a PTLOX flow control valve, or connect the flow control valve directly to the most distal Minilator outlet. Ensure flow control valve setting is at zero (0). Then connect the low pressure hose to the PTLOX system. Purge system to clear the lines of any contaminants and return setting to zero (0). Attach humidifier assemblies as required and set the flow rates to the prescribed values.

WARNING: A Flow control valve, with index set at zero (0) must be attached to the most distal Minilator outlet valve from the Minilator inlet valve prior to connecting low pressure

Disassembly and Storage. Turn off the oxygen source to the Minilator. Disconnect the hoses from the Minilator outlets and replace the dust caps. Disconnect the hose from the Minilator inlet or connector, and remove the connector from the inlet. Replace the dust cap. Store the Minilator and connector, if applicable.

Operational Checklist.

- Inventory and inspect components.

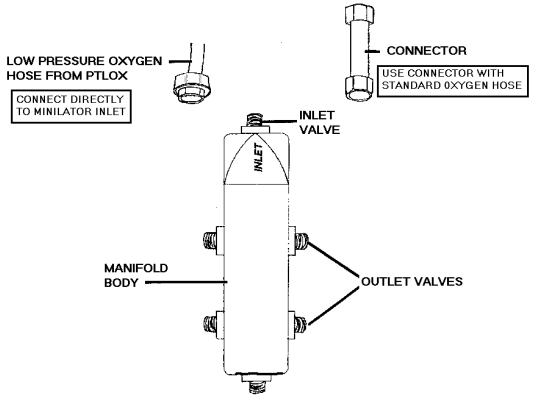
Assembly:

- Remove dust caps and connect hoses to outlet and inlet valves.
- Clear lines of contaminant with oxygen flow.
- Connect delivery hoses to flowmeter/humidifier assemblies and purge system.
- Set prescribed flow rates.

Disassembly and Storage:

- Turn off oxygen to the Minilator.
- Disconnect hoses from the Minilator inlet and outlet valves.
- Replace dust caps on valves.

Store Minilator and connector, if applicable.



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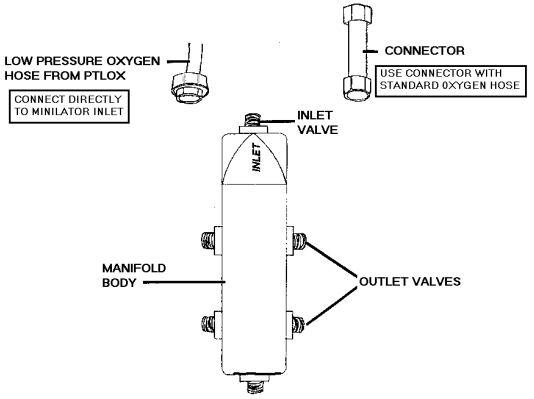

PROPAQ 206EL Patient Vital Monitor

Features

ECG, 3-lead or 5-lead configurations, 0.05-40/0.5-40 Hz
NIBP, with neonatal, pediatric, and adult modes
Temperature, 2 channels: YSI™ 400 and 700 series-compatible connectors
Defibrillator synchronization
Real-time analog output of ECG
Electrocautery noise suppression on all channels
Two invasive pressure channels
Pulse oximetry (SpO2)

Quick Reference:

Vital Signs:

To Select:	From Main Menu Press:
ECG Lead	ECG>ECG Lead
Mon or Ext ECG bandwidth	ECG>More
Automatic or manual NIBP	NIBP>Auto/Man
Zeroing pressure transducer	Inv Prs>Zero P1 or Zero P2
Rapid NIBP cycling	NIBP>Turbocuf (takes as many
measurements as possible in 5 min)	

Pushbutton Keys:	Suspends or resumes alarm tone
ALARMS	Suspend period is 90 seconds
NIBP	Starts or stops an NIBP reading
FREEZE/UNFREEZE	Freezes or unfreezes waveforms
MAIN MENU	Returns to top level menu

Setup Menu:

To:	From Main Menu Press:
Change patient mode	Setup>More>Change
View vital sign trends	Setup>Trends>Nxt Trnd
Customize alarm limits to patient VS	Setup>Alarms>Stat Set
Scale all waveforms for best view	Setup>Statscale
Change heart or alarm tones	Setup>More
Selecting waveforms for display	Setup>Wave Sel

Power Adapters

In the United States, the adapter can be safely plugged into the AC main source.

When using a transport vehicle's battery system to provide input power, surges caused by a defect in the vehicle's power system may blow a fuse in the Propaq's side panel.

PROPAQ 206EL Patient Vital Monitor

Features

ECG, 3-lead or 5-lead configurations, 0.05-40/0.5-40 Hz
NIBP, with neonatal, pediatric, and adult modes
Temperature, 2 channels: YSI™ 400 and 700 series-compatible connectors
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Change heart or alarm tones	Setup>More
Selecting waveforms for display	Setup>Wave Sel

Power Adapters

In the United States, the adapter can be safely plugged into the AC main source.

When using a transport vehicle's battery system to provide input power, surges caused by a defect in the vehicle's power system may blow a fuse in the Propaq's side panel.

The Power Adapter for the 206EL can be configured for 200-240V AC power sources.

1. Unplug power adapter's removable cord from the power adapter and from the AC mains outlet.
2. Turn the power adapter so you can see the window that indicates the voltage setting.
3. Using a small, flat-blade screwdriver, carefully pry the fuse module from the power adapter.
4. Remove the fuse carrier and rotate it so you can see the fuses.
5. Remove both fuses from the carrier by lifting them out with your fingers.
6. Replace the fuses with T400 mA/250V, Time Delay, 5X20 mm fuses on both sides. Unit comes with T800 mA/250V, Time Delay, 5X20 mm fuses.

NOTE: Spare fuses are contained in the housings above the fuses in the fuse module as shown in the figure below. Between the fuses is a small printed circuit board (PCB) that sets the power adapter to the desired AC mains voltage. When handling the fuse module, the PCB may slide out. Remove the PCB to change the voltage setting as seen on the outside of the fuse module.

Battery Care

Recharge time with instrument off=6-8 hrs
Recharge time with instrument on=8-12 hrs
Recharge time until monitor is usable, starting with discharged but non-faulty battery=<2 min (longer time required before NIBP, printer, and O2 are available)

Battery duration for monitors without the Expansion Module but with the SpO_2 option, , typical monitor "run-time" is 2.5-3.5 hours at 25°C for a new, fully charged battery. This is when all patient channels are active and measurements are taken every 15 min.

Actual voltage displayed on initial startup screen. When PROGRAM or TIME/DAY button is pressed, or when one of the Service Menu functions is selected, the battery voltage also appears along with other information relating to the selected function.

Battery Voltage		Approximate Operating Time at 25° C
7.8V	Monitor which is fully functional and displaying no error messages	4.5 hrs
<7.8V	Flashing **LOW BATT** message	1.5 hrs
<7.6V	LOW BATT, NIBP DISABLED, PRINTER DISABLED Equipment alerts; NIBP channel and printer disabled	45 min
<7.4V	VERY LOW BAT, NIBP DISABLED, PRINTER DISABLED Equipment alerts	15 min
<7.3V	VERY LOW BAT, NIBP DISABLED, PRINTER DISABLED, CO2 HEATER DISABLED Equipment alerts	5 min
=7.0V	Unit shutdown	

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The Power Adapter for the 206EL can be configured for 200-240V AC power sources.

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2. Turn the power adapter so you can see the window that indicates the voltage setting.
3. Using a small, flat-blade screwdriver, carefully pry the fuse module from the power adapter.
4. Remove the fuse carrier and rotate it so you can see the fuses.
5. Remove both fuses from the carrier by lifting them out with your fingers.
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<7.3V	VERY LOW BAT, NIBP DISABLED, PRINTER DISABLED, CO2 HEATER DISABLED Equipment alerts	5 min
=7.0V	Unit shutdown	

Priming the Administration Set
Use only IVAC 25 or 28 series Administration sets.
Close regulating clamp. Spike container, fill drip chamber to fill line.
Check vent position.
Slowly prime set, tapping and inverting cassette and any Y sites to expel all air.

Cassette Insertion
Turn instrument **ON** before inserting cassette.
Ensure slide clamp is pulled out completely.
Insert cassette at all upward angle, then snap in place.
Slide clamp must be flush with cassette.
Ensure tubing collar correctly seated.
Three "beeps" indicate proper placement.

Instrument Quick Set-up
Verify instrument is turned **ON**.
Select Channel by Pressing desired channel key (A, B, or C).
Press Select to move highlighted bar to choose setting to change.
i.e. Rate, Volume Remaining or to clear Volume Infused
Use↑, Fast↑, or Fast↓ to program new settings.
To change direction of the "Fast" keys, press the corresponding ↑or ↓.
To recall a setting before Enter is pressed, press More Options, press Recall.
Press Enter when programming complete.
Press START/STOP key to begin or stop infusion.
Verify settings on Standard Display page.
Verify infusion status – INFUSING, STOPPED, ALARM, KVO, STANDBY,
FAULT. SERVICE
Verify flow of solution from the drip chamber

Titration of Rate
Access desired channel by pressing, channel key (A, B, or C).
Change the rate by using the ↑, ↓, Fast↑ or Fast↓.
Press Enter
NOTE: Infusion does not stop as the rates are being changed and the new rate is in effect immediately upon pressing the ENTER key.

Clearing the Volume Infused
Access desired channel by pressing channel key (A, B, or C).
Press Select until Volume Infused (VI) is highlighted.
Press Clear to reset to zero.
Press Enter.
***NOTE**: Information does not clear from the Total Volume*

Clearing the Total Volume Infused for all channels, primary and secondary
Press MORE OPTIONS until the TotVol softkey appears.

IVAC Multi-channel Fluid Infusion System

Priming the Administration Set
Use only IVAC 25 or 28 series Administration sets.
Close regulating clamp. Spike container, fill drip chamber to fill line.
Check vent position.
Slowly prime set, tapping and inverting cassette and any Y sites to expel all air.

Cassette Insertion
Turn instrument **ON** before inserting cassette.
Ensure slide clamp is pulled out completely.
Insert cassette at all upward angle, then snap in place.
Slide clamp must be flush with cassette.
Ensure tubing collar correctly seated.
Three "beeps" indicate proper placement.

Instrument Quick Set-up
Verify instrument is turned **ON**.
Select Channel by Pressing desired channel key (A, B, or C).
Press Select to move highlighted bar to choose setting to change.
i.e. Rate, Volume Remaining or to clear Volume Infused
Use↑, Fast↑, or Fast↓ to program new settings.
To change direction of the "Fast" keys, press the corresponding ↑or ↓.
To recall a setting before Enter is pressed, press More Options, press Recall.
Press Enter when programming complete.
Press START/STOP key to begin or stop infusion.
Verify settings on Standard Display page.
Verify infusion status – INFUSING, STOPPED, ALARM, KVO, STANDBY,
FAULT. SERVICE
Verify flow of solution from the drip chamber

Titration of Rate
Access desired channel by pressing, channel key (A, B, or C).
Change the rate by using the ↑, ↓, Fast↑ or Fast↓.
Press Enter
NOTE: Infusion does not stop as the rates are being changed and the new rate is in effect immediately upon pressing the ENTER key.

Clearing the Volume Infused
Access desired channel by pressing channel key (A, B, or C).
Press Select until Volume Infused (VI) is highlighted.
Press Clear to reset to zero.
Press Enter.
***NOTE**: Information does not clear from the Total Volume*

Clearing the Total Volume Infused for all channels, primary and secondary
Press MORE OPTIONS until the TotVol softkey appears.

Press TotVol. Total volume page appears.
Press ClrTot. All values for each channel will clear and flash.
Press Enter.
***NOTE**: Information is also cleared from all channel pages, A, B, and C.*

Stopping a channel
TEMPORARILY
Access desired channel by pressing channel key (A, B, or C).
Press START/STOP key. Infusion status STOPPED on Channel page.
•Troubleshooting: There will be a two-toned CHANNEL NOT IN USE advisory in two minutes, if cassette remains in channel.
INDEFINITELY
Access desired channel by pressing channel key (A, B, or C).
Press START/STOP key. Infusion status STOPPED on Channel page.
Return to the Standard Display page.
Press Stndby softkey
Standby option is only available on Standard Display page, when cassette is in a STOPPED channel.

Clearing information from the standard display page when channel not in use
The channel must be stopped and the cassette removed.
The channel must not be selected, i.e. Status line for that channel must not be highlighted.
To clear the Status line highlighting, press any infusing channel key.
The information for the channel not in use will disappear from the Standard Display page after 2 minutes.
***NOTE**: Infusing channel should always be stopped prior to removing cassette.*

SECONDARY INFUSION

Physical set-up for Secondary delivery
Use a check valve primary set.
Lower the primary container at least 8 inches below the secondary container.
Using a 16 gauge needle attach secondary Set to Upper Y Site of primary set, below check valve.

WARNING: The use of smaller gauge needles will result in sympathetic flow from the primary container, in some circumstances. Running Secondary infusions at rates greater than 275 ml/hr will result in sympathetic flow from the primary container.

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Press TotVol. Total volume page appears.
Press ClrTot. All values for each channel will clear and flash.
Press Enter.
***NOTE**: Information is also cleared from all channel pages, A, B, and C.*

Stopping a channel
TEMPORARILY
Access desired channel by pressing channel key (A, B, or C).
Press START/STOP key. Infusion status STOPPED on Channel page.
•Troubleshooting: There will be a two-toned CHANNEL NOT IN USE advisory in two minutes, if cassette remains in channel.
INDEFINITELY
Access desired channel by pressing channel key (A, B, or C).
Press START/STOP key. Infusion status STOPPED on Channel page.
Return to the Standard Display page.
Press Stndby softkey
Standby option is only available on Standard Display page, when cassette is in a STOPPED channel.

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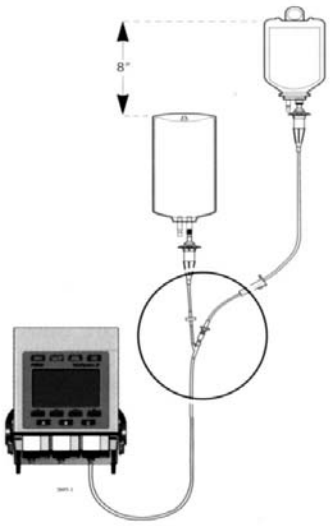
Physical set-up for Secondary delivery
Use a check valve primary set.
Lower the primary container at least 8 inches below the secondary container.
Using a 16 gauge needle attach secondary Set to Upper Y Site of primary set, below check valve.

WARNING: The use of smaller gauge needles will result in sympathetic flow from the primary container, in some circumstances. Running Secondary infusions at rates greater than 275 ml/hr will result in sympathetic flow from the primary container.



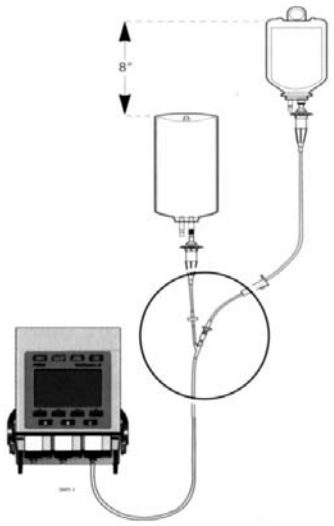
Programming Secondary Infusion
Select Channel by pressing desired channel key (A, B, or C).
Press More Options, press 2^{o} Sec softkey to access Secondary programming page.
Secondary page is reverse highlighted.
Press Select to move highlighted bar to choose setting to change.
Use ↑, ↓, Fast↑ or Fast↓ to program new settings.
Press Enter when programming complete.
Open secondary roller clamp.
Press START/STOP key while on the secondary page to start the secondary infusion.
Verify flow of solution from the secondary drip chamber.
When the VR on the secondary infusion reaches zero, the primary rate resumes.

WARNING: Failure to enter a correct Secondary Volume Remaining may result in the secondary solution being administered at an incorrect rate. The fluid in the secondary set stops when it reaches the level of the fluid in the primary container.

To interrupt the Secondary and return to the Primary
Select Channel by pressing desired channel key (A, B, or C).
Press More Options, press 1^{o} Pri softkey to access Primary programming page.
Press START/STOP key while on the secondary page to begin primary infusion.

ADVANCED DOSE RATE CALCULATION

NOTE*: Infusion must be stopped before accessing the Advanced Dose Rate Calculation feature. Infusion must be stopped to change the Drug Name, Patient Weight or Drug Concentration values.*



Programming Secondary Infusion
Select Channel by pressing desired channel key (A, B, or C).
Press More Options, press 2^{o} Sec softkey to access Secondary programming page.
Secondary page is reverse highlighted.
Press Select to move highlighted bar to choose setting to change.
Use ↑, ↓, Fast↑ or Fast↓ to program new settings.
Press Enter when programming complete.
Open secondary roller clamp.
Press START/STOP key while on the secondary page to start the secondary infusion.
Verify flow of solution from the secondary drip chamber.
When the VR on the secondary infusion reaches zero, the primary rate resumes.

WARNING: Failure to enter a correct Secondary Volume Remaining may result in the secondary solution being administered at an incorrect rate. The fluid in the secondary set stops when it reaches the level of the fluid in the primary container.

To interrupt the Secondary and return to the Primary
Select Channel by pressing desired channel key (A, B, or C).
Press More Options, press 1^{o} Pri softkey to access Primary programming page.
Press START/STOP key while on the secondary page to begin primary infusion.

ADVANCED DOSE RATE CALCULATION

NOTE*: Infusion must be stopped before accessing the Advanced Dose Rate Calculation feature. Infusion must be stopped to change the Drug Name, Patient Weight or Drug Concentration values.*

Watchdog
Continuous audible tone.
Safety checks built into the software have detected a situation which may be transient in nature.
Blank screen, with all green and red LED lights flashing.
Turn instrument off, then on, by pressing the ON/OFF key.
All current settings are kept in memory.
Restart any lines previously infusing by pressing the appropriate channel key and then the **START/STOP** key.

NOTE*:* If the WATCHDOG ALARM recurs, the instrument must be returned to the Biomedical Engineering Department or department responsible for servicing.

Fault
European police siren sound.
May be transient or correctable situation.
Fault description message on Standard Display Flashing red light.
Press Quiet softkey to silence fault.
Press alarming channel key to access Alarm Information page and follow instructions:
Clear Fault by pressing Retry softkey.
If alarm recurs, press the Service softkey.
Pressing Service disables the pump channel and the word SERVICE will appear on the Status line!!!!!!
The other two channels may still be used, but the instrument will eventually need to be serviced.

Advisory
Two toned audible.
Advisory description message on Standard Display.
Flashing red light on channel.
Press Quiet softkey to silence advisory.•**Example: INFUSION COMPLETE Advisory**
Status line displays KVO rate.
Alarm description VR=O, on Standard Display page.

Press alarming channel key to access Alarm Information page and follow instructions:
Press the channel key again. The Volume Remaining line is highlighted.
Press Repeat softkey to enter the last Volume Remaining that has been programmed.
Press Enter.
Resume infusion and cancel KVO rate by pressing START/STOP key.

Alarm
4 quick beeps.
Flashing red light on alarming channel.
Alarm description message on Standard Display.
Press Quiet softkey to silence alarm tone.

Press alarming channel key, if needed, to access Alarm Information page.

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TROUBLESHOOTING

Watchdog
Continuous audible tone.
Safety checks built into the software have detected a situation which may be transient in nature.
Blank screen, with all green and red LED lights flashing.
Turn instrument off, then on, by pressing the ON/OFF key.
All current settings are kept in memory.
Restart any lines previously infusing by pressing the appropriate channel key and then the **START/STOP** key.

NOTE*:* If the WATCHDOG ALARM recurs, the instrument must be returned to the Biomedical Engineering Department or department responsible for servicing.

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European police siren sound.
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Press Repeat softkey to enter the last Volume Remaining that has been programmed.
Press Enter.
Resume infusion and cancel KVO rate by pressing START/STOP key.

Alarm
4 quick beeps.
Flashing red light on alarming channel.
Alarm description message on Standard Display.
Press Quiet softkey to silence alarm tone.

Press alarming channel key, if needed, to access Alarm Information page.

•Example: **AIR-IN-LINE Alarm**

Press alarming channel key to access Alarm Information page.
Press ClrAir softkey to clear small amounts of air from the tubing (0.2 ml/pulse, maximum 5 presses per alarm; TOTAL = I ml)
Three "beeps" indicates that the air has passed the Air Sensor.
Press START/STOP key to resume infusion.

TROUBLSHOOTING

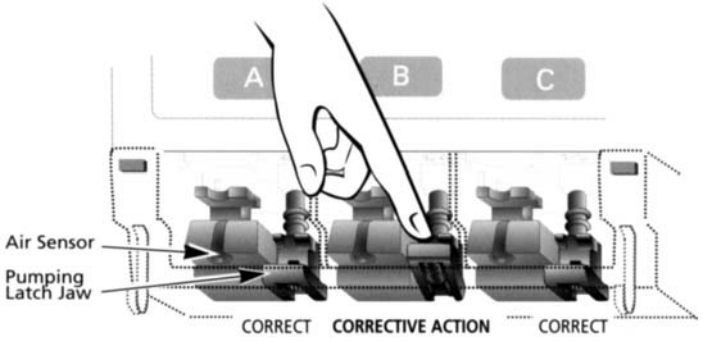
•Example: **CHECK FLUID SIDE Alarm**

Press alarming channel key to access Alarm Information page.
Check for any upstream (pump to container) obstruction to flow, such as closed roller clamp, kinked tubing, empty syringe or burette, or closed air vent.
Correct the restriction to flow, if none found, press the CONFIRM softkey.
Restart the infusion by pressing the START/STOP key.

•Example: **PUMPING LATCH CLOSED Alarm**

The pumping latch jaw next to the air sensor is in the closed position and **must** be open to accept a cassette.
Using your finger, push down pumping latch jaw until it snaps open.
If the latch will not open, press alarming channel key to access Alarm Information page.
If lower jaw is visibly broken, press SERVICE and contact qualified service personnel.
Pressing SERVICE disables the channel and the word SERVICE will appear on the Status line. The other two channels can still be used.

CAUTION: *Never use a blunt instrument to open a closed pumping latch!!*



Battery Capacity
A fully charged battery provides 6-8 hours of operating time with rates at 125 ml/hr per channel.

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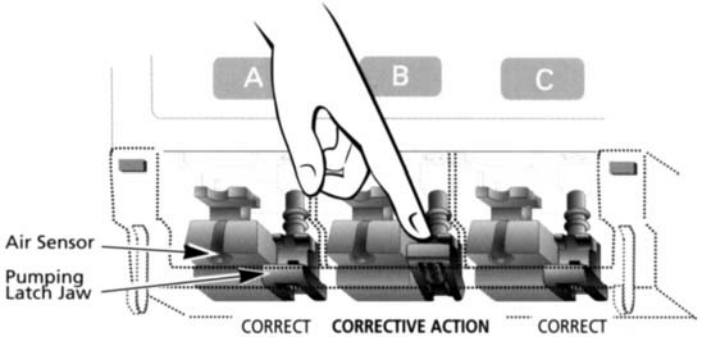

Battery Capacity
A fully charged battery provides 6-8 hours of operating time with rates at 125 ml/hr per channel.

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UNI-VENT™ EAGLE™ MODEL 754M
Transport Ventilator

INTERCONNECTIONS:

CAUTION: Follow interconnection instructions prior to placing this device into service (see Figure below).

1. For use with external oxygen: connect high-pressure oxygen hose between OXYGEN inlet port and a 50-PSI external oxygen source. Use only medical-grade oxygen.
2. For use with external air: connect high-pressure air hose between AIR inlet port and a 50-PSI external air source. Use only medical-grade compressed air.
3. Connect a disposable ventilator circuit to its respective gas outlet, transducer, and exhalation valve connectors on the Model 754/754M Connector Panel. Observe directions included with each disposable ventilator circuit.
4. Connect Universal AC Power Supply, or 12 VDC Power Cable, between EXTERNAL POWER JACK and external power source.

NOTE: The standard Universal AC Power Supply is operable from AC voltages between 90 and 265 volts, 47 to 440 Hz. Voltage and line frequency sensing is automatic. An optional Universal AC Power Supply (standard with Model 754M), is operable from 115/230 VAC, 50 to 400 Hz (voltage and line frequency sensing is automatic), and includes a 16-30V DC-DC Converter. It accepts external DC voltages ranging from 16 to 30 volts which connect to the secondary input leads provided. Attachment to a mating connector is required and polarity must be observed. The black input lead is positive, white is negative. Do not attach the braided shield.

NOTE: For 11-15 VDC operation, connect an appropriate power cord between EXTERNAL POWER JACK and the 11-15 VDC power source. A 12 VDC Power Cable is provided for attachment to an automotive power source, negative ground.

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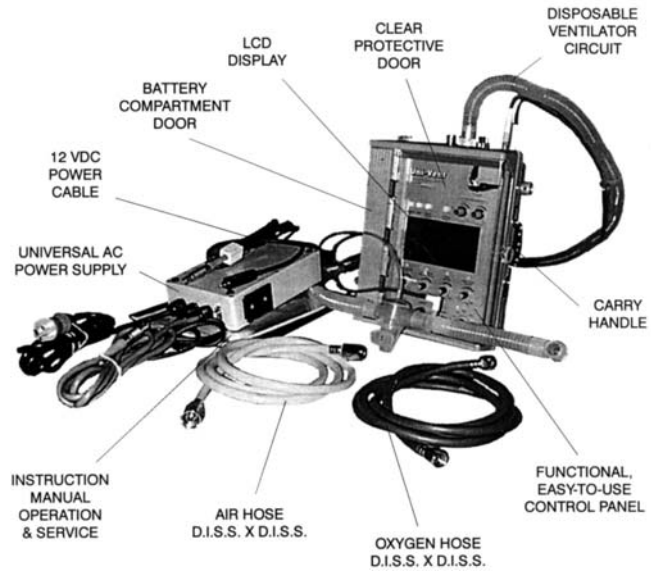
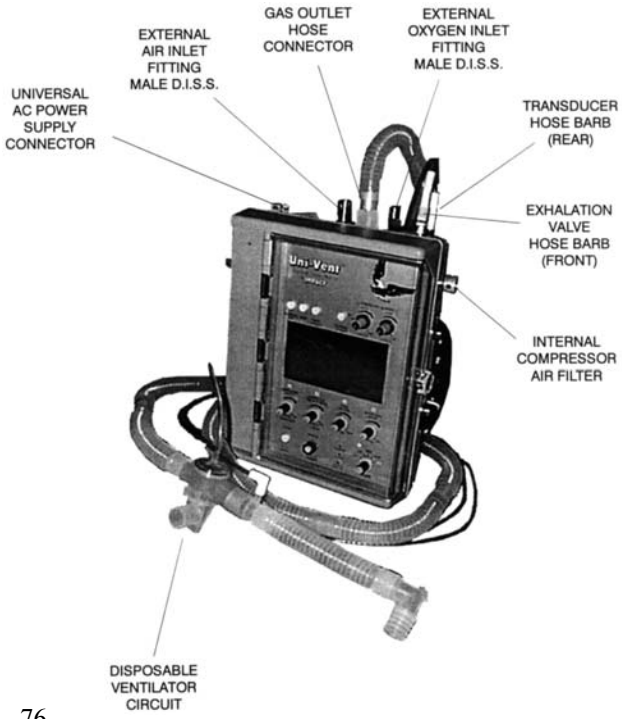
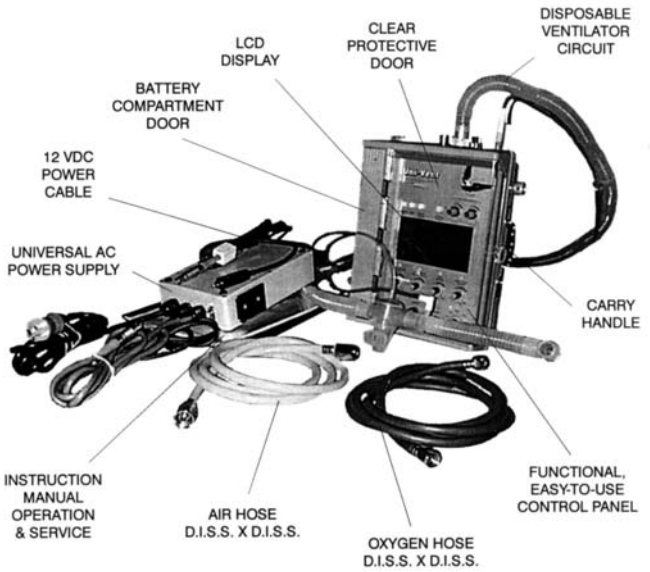

DISPOSABLE VENTILATOR CIRCUIT
CLEAR PROTECTIVE DOOR
LCD DISPLAY
BATTERY COMPARTMENT DOOR
12 VDC POWER CABLE
UNIVERSAL AC POWER SUPPLY
CARRY HANDLE
INSTRUCTION MANUAL OPERATION & SERVICE
AIR HOSE D.I.S.S. X D.I.S.S.
OXYGEN HOSE D.I.S.S. X D.I.S.S.
FUNCTIONAL, EASY-TO-USE CONTROL PANEL


GAS OUTLET HOSE CONNECTOR
EXTERNAL OXYGEN INLET FITTING MALE D.I.S.S.
EXTERNAL AIR INLET FITTING MALE D.I.S.S.
UNIVERSAL AC POWER SUPPLY CONNECTOR
TRANSDUCER HOSE BARB (REAR)
EXHALATION VALVE HOSE BARB (FRONT)
INTERNAL COMPRESSOR AIR FILTER
DISPOSABLE VENTILATOR CIRCUIT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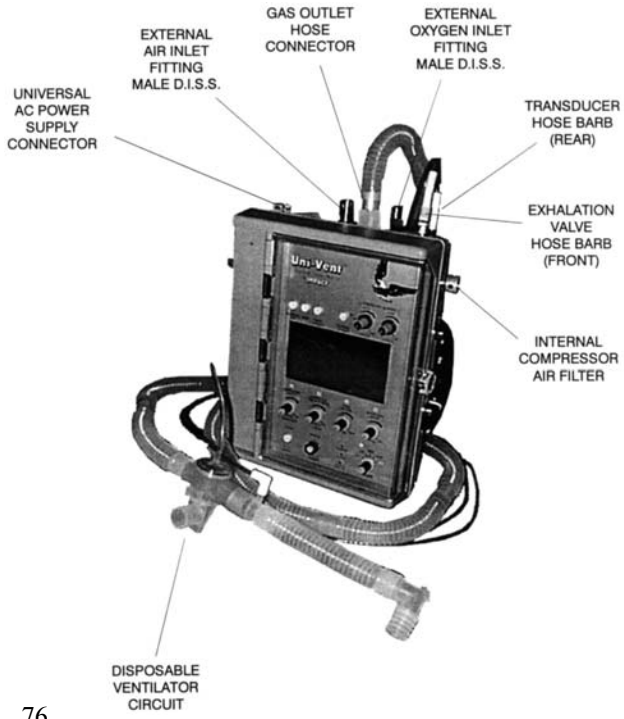
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EXHALATION VALVE HOSE BARB (FRONT)
INTERNAL COMPRESSOR AIR FILTER
DISPOSABLE VENTILATOR CIRCUIT

OPERATION

INTRODUCTION

User's will find this instrument quite easy-to-learn and operate. The following text presents a brief overview of device features. A complete understanding of its capabilities and limitations will allow you to take advantage of its many features.

Your Model 754/754M is a portable, electronically controlled ventilator, compressor, air/oxygen mixer. It is controlled by an internal microprocessor (CPU) which continuously monitors and displays airway pressure, control settings, alarm parameters, gas source(s), gas flows, gas blends, and power signals. ACV, SIMV and CPAP modes are operable with or without PEEP, with or without SIGH. ACV and SIMV are operable with or without Pressure Plateau. All modes are PEEP and altitude compensable to minimize your patient's work-of-breathing and automatic ventilatory backup assures continued mechanical support if the patient becomes apneic. An adjustable pressure limit control limits peak inspiratory pressures and high pressure alarm setpoint.

The Model 754/754M can provide gas mixtures with oxygen content ranging from 21 to 100%. Gases may be blended from external oxygen (compressed gas cylinder or PTLOX) and internal compressor, or external oxygen and external compressed air. External compressed air, delivered from an electric compressor, must be oil-less and filtered. Acceptable input gas pressures may range up to 80-PSI without effecting measurement accuracy or danger to internal componentry. It is operable in any position; upright, on its side, or lying flat.

Uni-Vent™ is operable from internal, rechargeable batteries; 11-15 volts DC (negative ground). Its battery pack may be recharged within the range of either of the aforementioned DC voltages. A Universal AC Power Supply and 12 VDC Power Cable is provided. The Universal AC Power Supply connects directly to AC mains providing 90 to 265 volts, 47 to 440 Hz. An optional Universal AC Power Supply (standard with the Model 754M) connects directly to AC mains providing 115/230 volts, 50 to 400 Hz (voltage and line frequency sensing is automatic), and permits use from external DC voltages, ranging from 16 to 30 volts which connect to the secondary input leads provided. Attachment to a mating connector is required and polarity must be observed. The black input lead is positive; the white is negative. Do not attach the braided shield. The Model 754/754M does not consume gas for operating power-all gas is dedicated for patient care.

Your ventilatory system employs a comprehensive alarm system. Alarms are categorized as Operating, Nonoperating, or Advisory (see section entitled ALARM FUNCTIONS for complete descriptions of each alarm).

The Model 754/754M is extremely durable and designed for all environments. Its case is injection molded from polycarbonate material. It is appropriate for use

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with adults, children and infants - in clinical, field hospital, aeromedical, homecare, and prehospital (ALS, ATLS, ACLS) settings. Its small size and weight facilitates transport, deployment and storage.

FEATURES

- Microprocessor control of all functions including automatic monitoring of internal battery and external power sources, internal compressor and external gases.
- Extensive alarm monitoring of operating, non-operating and advisory conditions.
- Contemporary design to facilitate transport and placement.
- Gas-efficient electronic control circuitry eliminates all pneumatic-logic circuits, and any dependency on gas for operating power.
- Rechargeable batteries, fully compatible with vehicular electrical systems and airborne environments.
- Self-contained system, may be operated without attachment of external gas(es).
- Numerical panel markings indicate sequence-of-operation steps to simplify and speed start-up.
- Graphics display includes 12-second pressure waveform, its amplitude is calibrated to the adjacent digital bar graph.
- Automatically compensates pressure transducer to altitude-related barometric pressure changes up to 25,000 ft.

SELF-CHECK

Uni-Vent™ undergoes a self-checking process every time its MODE Selector Switch is turned from "OFF" to ACV, SIMV, or CPAP; or from CAL to ACV, SIMV, or CPAP. After the initial SELF-CHECK is performed, selfchecking is not repeated if the operator turns the MODE Selector Switch to another operating mode position.

The SELF-CHECK process consists of interaction between Uni-Vent™ microprocessor and peripheral circuitry to verify external power/internal battery status, memory check, pressure transducer calibration and control panel settings.

NOTE: If external oxygen and/or external compressed gas are connected, each gas pressure must be at least 40-PSI (+/- 2 PSI) at the time SELF-CHECK is performed.

WARNING: SELF-CHECK must be performed with the disposable ventilator circuit disconnected from the patient. This insures that the TRANSDUCER connection is open to ambient atmosphere. Ignoring this requirement could cause the SELF- CHECK process to sense a residual airway pressure. Current information is compared to previous calibration information stored in memory. Accordingly, any residual pressure would result in a false reading leading to a SELF-CHECK failure.

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If Uni-Vent™ fails SELF-CHECK, a VENTILATOR FAIL Alarm will occur. Return the MODE Selector Switch to its OFF position and then repeat this procedure. If SELF-CHECK fails again, contact qualified service personnel - DO NOT ATTEMPT PATIENT USE.

SELF-CHECK will automatically alert attendant personnel if the pressure transducer calibration "zero" baseline exceeds +/- 1 cm H_20 from its last calibration. A TRANSDUCER CALIBRATION Alarm activated during SELFCHECK will cause an audible tone and the AMC to display:

TRANSDUCER CALIBRATION
CALIBRATE TRANSDUCER
VENTILATOR FAILURE
DETECTED

FAILURE CODE I
* SELF-CHECK FAILURE!

-OR-

if SELF-CHECK Alarm is not related to the Transducer Calibration:

VENTILATOR FAILURE DETECTED

FAILURE CODE I
* SELF-CHECK FAILURE!

If only the pressure transducer calibration portion of SELF-CHECK fails, proceed to the section entitled TRANSDUCER CALIBRATION - DO NOT ATTEMPT PATIENT USE.

USER PROGRAMS

The Model 754/754M contains a USER PROGRAMS menu that allows certain operating characteristics to be changed. Some changes can be stored in Eagle™‘s memory - temporary changes are not. Program changes that get stored in memory apply each time the ventilator is operated or, until the user makes a new program change effecting that particular characteristic. Temporary changes are not stored in memory and will last until ventilator power is turned OFF. User programmable/selectable characteristics are: LCD Backlight Threshold default, LCD Contrast default, Trigger Level Sensitivity, Set Spontaneous Flow, Demonstration Mode (DEMO), and TEST BACKUP VENTILATOR.

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CALIBRATE TRANSDUCER
VENTILATOR FAILURE
DETECTED

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The bottom line of each menu in USER PROGRAMS contains the following information

“#### Hrs" - where "####" represents cumulative hours of operation since the last Preventative Maintenance was performed.
“### Dys" - where "###" represents cumulative days since the last Preventative Maintenance was performed
"Version #,##” - where #.## indicates the software version.

To enter the USER PROGRAMS menu, simultaneously press MUTE and MANUAL BREATH/TRIGGER Pushbutton Switches while turning the MODE Control Switch to A/C, SIMV, CPAP, or CAL.

- Follow on screen prompts.
- Press adjacent pushbutton switches to make your selections.
- Press pushbutton switch adjacent to "EXIT" to leave USER PROGRAMS menu and return to selected mode of operation:

A/C
A/C DEMO
SIMV
SIMV DEMO
CPAP
CPAP DEMO
CAL

LCD BACKLIGHT THRESHOLD DEFAULT: Sets the LCD's backlight setpoint. When programmed, it defaults to current ambient lighting conditions to assure adequate display illumination during operation. Changes can be stored in memory by pressing the pushbutton switch adjacent to the on screen "SAVE" prompt. If "SAVE" is not pressed, the previously stored setpoint remains.

LCD CONTRAST DEFAULT: Controls the LCD's contrast setpoint. Depending upon viewing comfort, users may choose to increase or decrease color contrast between activated LCD pixels and their background. Any increase or decrease to the setpoint is seen on the LCD. Changes can be stored in memory or temporarily used during the current operating cycle. To store changes in memory, the pushbutton switch adjacent to the on screen "SAVE" prompt must be pressed. If "SAVE" is not pressed, the previously stored setpoint remains.

TRIGGER LEVEL SENSITIVITY: Controls the inspiratory work-of-breathing setpoint for patient-triggered breaths. Eagle™‘s default sensitivity is 1.5 to 2.0 cm H_20 below end pressure. This USER PROGRAM allows Trigger Level Sensitivity to be temporarily changed until operating power is turned OFF. It is adjustable from 1.0 to 6.0 cm H_20 in 0.5 cm H_20 increments. For spontaneous breaths occurring in SIMV and CPAP, the sensitivity cannot be set below 2 cm H_20. Sensitivity adjustments to 2 cm H_20, or higher, will affect all breaths. Adjustments

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made below 2 cmH20 Will only affect mandatory breaths. New settings cannot be saved in memory. Once operating power is turned "OFF" Trigger Level Sensitivity is returned to its default value.

NOTE: Under most operating conditions Eagle™‘s default Trigger Level Sensitivity should be used. Users are cautioned to carefully consider their operating environment before selecting a different Trigger Level Sensitivity. If 1.0 cm H_20 is selected, motion artifact may cause false triggering of breaths. Conversely, selecting a sensitivity above 2.0 cm H_20 to compensate for excessive motion artifact, or physiologic conditions, can cause excessive inspiratory work-of-breathing.

SET SPONTANEOUS FLOW: Eagle™‘s default Spontaneous Flow is 60 LPM. This USER PROGRAM allows Spontaneous Flow (for use in SIMV or CPAP) to be temporarily changed until operating power is turned OFF. It is adjustable from 10 to 60 LPM in 5 LPM increments. New settings cannot be saved in memory. Once operating power is turned "OFF", Spontaneous Flow is returned to its default value.

DEMONSTRATION MODE (DEMO): Permits users to operate this device in a mode that is quite helpful for demonstration/training purposes. DEMO mode allows users to make settings, adjustments, trigger alarms, and view simulation waveforms on Eagle™‘s LCD. DEMO mode does not allow Disconnect Alarm activation or Proximal Pressure Transducer operation.

WARNING: DEMO mode is not for patient use. Once operating power is turned "OFF" DEMO mode is cancelled.

TEST BACKUP VENTILATOR: Permits user to test the BACKUP VENTILATOR and MANUAL TRIGGER. Activating the BACKUP VENTILATOR will cause it to function as described in the section entitled BACKUP VENTILATOR. To leave the BACKUP VENTILATOR function and return to normal operation, turn the MODE Control Switch to "OFF" then "ON" to desired operating mode.

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saved in memory. Once operating power is turned "OFF" Trigger Level Sensitivity is returned to its default value.

NOTE: Under most operating conditions Eagle™‘s default Trigger Level Sensitivity should be used. Users are cautioned to carefully consider their operating environment before selecting a different Trigger Level Sensitivity. If 1.0 cm H_20 is selected, motion artifact may cause false triggering of breaths. Conversely, selecting a sensitivity above 2.0 cm H_20 to compensate for excessive motion artifact, or physiologic conditions, can cause excessive inspiratory work-of-breathing.

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MODES OF OPERATION

Your Model 754/754M has been carefully designed to ease the learning transition commonly associated with new instruments. In addition to its clean, uncluttered appearance, Uni-Vent includes numerical panel markings to simplify and speed start-up. Only the five primary controls, common to most applications, are marked. They are numbered in order of use, in a 5-step sequence. It is possible to initiate operation using as few as 3-controls.

- Step 1: Select operating mode; ACV, SIMV or CPAP
- Step 2: Set VENTILATION RATE
- Step 3: Set INSPIRATION TIME

NOTE: If your protocol calls for use only at the 1:2 I:E RATIO preset, Step 3 can be bypassed.

- Step 4: Set TIDAL VOLUME
- Step 5: Set the AIR/OXYGEN MIXER for an F102 between 21 and 100

NOTE: If your protocol involves use without external oxygen, or with 100% oxygen, the AIR/OXYGEN MIXER control remains either fully counterclockwise or fully clockwise and control #5 can be bypassed.

Control panel settings may be adjusted at any time. In normal use, adjustments are typically made immediately following SELF-CHECK, however, the 1:2 I:E RATIO and extents for $FI0_2$ and PRESSURE ALARMS may be preset.

The Model 754/754M can operate in the following modes:

1. ASSIST-CONTROL VENTILATION: WITH/WITHOUT PEEP, WITH/WITHOUT SIGH
2. ASSIST-CONTROL VENTILATION: WITH/WITHOUT PEEP, WITH/WITHOUT PRESSURE PLATEAU
3. SYNCHRONIZED INTERMITTENT MANDATORY VENTILATION: WITH/WITHOUT PEEP, WITH/WITHOUT SIGH
4. SYNCHRONIZED INTERMITTENT MANDATORY VENTILATION: WITH/WITHOUT PEEP, WITH/WITHOUT PRESSURE PLATEAU
5. CONTINUOUS POSITIVE AIRWAY PRESSURE: WITH/WITHOUT PEEP
6. CONTROL VENTILATION (apnea backup of ACV, SIMV and CPAP)
7. CONTROL VENTILATION (backup ventilator)

WARNING: Functions that are dependent upon accurate pressure readings should only be used in conjunction with a protected airway. This will prevent "leaks" from distorting pressure signals. **DO NOT** use pressure dependent functions with an unprotected airway. This applies primarily to use with uncuffed endotracheal tubes, uncuffed tracheostomy tubes, and resuscitation masks where the face-to-mask-seal integrity is frequently and typically compromised.

MODES OF OPERATION

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4. SYNCHRONIZED INTERMITTENT MANDATORY VENTILATION: WITH/WITHOUT PEEP, WITH/WITHOUT PRESSURE PLATEAU
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IMPORTANT NOTE: The Model 754/754M includes preset trigger sensitivity default.

Preset trigger sensitivity default is set between 1.5 and 2.0 cm H_20 below end pressure. Triggering sensitivity determines how much negative deflection a spontaneously breathing patient must generate before Uni-Vent initiates a mechanical breath or demand flow. In the Model 754/754M, triggering sensitivity is both automatic and PEEP compensated. To change trigger sensitivity, or Spontaneous Flow for SIMV and CPAP, see section entitled (USER PROGRAMS).

During operation Uni-Vent's preset trigger looks for the next spontaneous breath to reach its trigger threshold. For whatever reason, if a spontaneous breath is in process when the trigger is activated, the following conditions prevail:

- If the patient's inspiratory pressure has not reached the trigger threshold, Uni-Vent will trigger when the threshold is reached.
- If the patient's inspiratory pressure has exceeded the trigger threshold, Uni-Vent will wait until the next spontaneous inspiration reaches threshold before triggering.

IMPORTANT NOTE: ACV, SIMV and CPAP ventilations are continuously monitored. Should apnea occur in one of these modes, UniVent's microprocessor would activate applicable alarms and initiate control ventilations (see section entitled CONTROL VENTILATION DURING APNEA).

NOTE: Uni-Vent includes built-in altitude compensation. Once you've performed a TRANSDUCER CALIBRATION, changes in altitude will have no effect upon pressure-related performance.

NOTE: Uni-Vent has been certified by an independent testing laboratory to meet electromagnetic interference (EMI) and radio frequency interference (RFI) shielding requirements. Certification includes both radiated emissions and conducted susceptibility.

ASSIST-CONTROL VENTILATION (ACV)

In ACV, Uni-Vent is configured to deliver a minimum ventilatory rate, preset inspiration time and preset tidal volume. Patient-initiated breaths, sensed by negative pressure deflection, cause Uni-Vent to trigger an "assisted" ventilation that is equal to its INSPIRATION TIME and TIDAL VOLUME settings. Controlled ventilations are delivered when there are no spontaneous respiration's or the patients' spontaneous ventilation rate attempts to fall below the current VENTILATION RATE setting. If this occurs, controlled ventilations are delivered at the VENTILATION RATE, INSPIRATION TIME and TIDAL VOLUME settings.

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IMPORTANT NOTE: The Model 754/754M includes preset trigger sensitivity default.

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Should the patient become apneic in the ACV mode, Uni-Vent will activate its APNEA Alarm and automatically begin controlled ventilations at its current VENTILATION RATE/INSPIRATORY TIME/TIDAL VOLUME control settings or 12 ventilations per minute/INSPIRATORY TIME/TIDAL VOLUME control settings - whichever is greater (see section entitled CONTROL VENTILATION DURING APNEA; *APNEA DURING ACV OR SIMV OPERA TION).*

ACV operation is permitted in combination with PEEP and/or SIGH, or PEEP and/or PRESSURE PLATEAU (SIGH will become disabled whenever PRESSURE PLATEAU is selected).

The following steps are required to initiate ASSIST-CONTROL operation:

1. Turn MODE Selector Switch to A/C. Allow SELF-CHECK tests to complete. Perform TRANSDUCER CALIBRATION if required (see section entitled TRANSDUCER CALIBRATION).

DO NOT connect disposable patient circuit to patient during SELF-CHECK.

When SELF-CHECK is completed, ACV cycling begins automatically. The INSPIRATION/EXHALATION Indicator will toggle accordingly during the inspiratory and expiratory cycle of each ventilation.

NOTE: When ACV cycling begins, the DISCONNECT Alarm will activate. This alarm will remain active until the disposable ventilator circuit is connected to the patient (see Step 3, below) and the pressure transducer detects a pressure rise during the next ventilator generated breath, or the ALARM MUTE/CANCEL Pushbutton Switch is pressed.

2. Adjust VENTILATION RATE, INSPIRATION TIME/I:E RATIO, TIDAL VOLUME, AIR/OXYGEN MIXER, LOW and HIGH AIRWAY PRESSURE ALARM Control settings as required. If LOW and HIGH AIRWAY PRESSURE ALARM's are not used, set their respective controls to 0 and 100.
3. Attach disposable ventilator circuit to patient's endotracheal or tracheostomy tube. Spontaneous breathing should cause the ventilator to trigger an assisted breath and cancel the DISCONNECT Alarm. A ventilator-generated controlled breath will also cause the DISCONNECT Alarm to cancel. The INSPIRATION/EXHALATION Indicator will continue to toggle during the inspiratory and expiratory cycle of each ventilation.
4. If PEEP is required, repeatedly press PEEP Pushbutton Switch until desired setting appears in LCD. (See section entitled USING POSITIVE END EXPIRATORY PRESSURE for complete instructions).
5. Press SIGH Pushbutton Switch if ACV operation with SIGH is required. SIGH ventilations are delivered once every 100 ventilations or 7-minutes, whichever occurs first. Each SIGH ventilation equals 150% of the INSPIRATION TIME

Should the patient become apneic in the ACV mode, Uni-Vent will activate its APNEA Alarm and automatically begin controlled ventilations at its current VENTILATION RATE/INSPIRATORY TIME/TIDAL VOLUME control settings or 12 ventilations per minute/INSPIRATORY TIME/TIDAL VOLUME control settings - whichever is greater (see section entitled CONTROL VENTILATION DURING APNEA; *APNEA DURING ACV OR SIMV OPERA TION).*

ACV operation is permitted in combination with PEEP and/or SIGH, or PEEP and/or PRESSURE PLATEAU (SIGH will become disabled whenever PRESSURE PLATEAU is selected).

The following steps are required to initiate ASSIST-CONTROL operation:

1. Turn MODE Selector Switch to A/C. Allow SELF-CHECK tests to complete. Perform TRANSDUCER CALIBRATION if required (see section entitled TRANSDUCER CALIBRATION).

DO NOT connect disposable patient circuit to patient during SELF-CHECK.

When SELF-CHECK is completed, ACV cycling begins automatically. The INSPIRATION/EXHALATION Indicator will toggle accordingly during the inspiratory and expiratory cycle of each ventilation.

NOTE: When ACV cycling begins, the DISCONNECT Alarm will activate. This alarm will remain active until the disposable ventilator circuit is connected to the patient (see Step 3, below) and the pressure transducer detects a pressure rise during the next ventilator generated breath, or the ALARM MUTE/CANCEL Pushbutton Switch is pressed.

2. Adjust VENTILATION RATE, INSPIRATION TIME/I:E RATIO, TIDAL VOLUME, AIR/OXYGEN MIXER, LOW and HIGH AIRWAY PRESSURE ALARM Control settings as required. If LOW and HIGH AIRWAY PRESSURE ALARM's are not used, set their respective controls to 0 and 100.
3. Attach disposable ventilator circuit to patient's endotracheal or tracheostomy tube. Spontaneous breathing should cause the ventilator to trigger an assisted breath and cancel the DISCONNECT Alarm. A ventilator-generated controlled breath will also cause the DISCONNECT Alarm to cancel. The INSPIRATION/EXHALATION Indicator will continue to toggle during the inspiratory and expiratory cycle of each ventilation.
4. If PEEP is required, repeatedly press PEEP Pushbutton Switch until desired setting appears in LCD. (See section entitled USING POSITIVE END EXPIRATORY PRESSURE for complete instructions).
5. Press SIGH Pushbutton Switch if ACV operation with SIGH is required. SIGH ventilations are delivered once every 100 ventilations or 7-minutes, whichever occurs first. Each SIGH ventilation equals 150% of the INSPIRATION TIME

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setting, which increases delivered volume by 50%. As a safety precaution, Uni-Vent does not allow the inspiratory portion of a SIGH breath to exceed 3seconds.

6. Press PLATEAU Pushbutton Switch if ACV operation with PRESSURE PLATEAU is required. SIGH is automatically disabled (OFF) when PLATEAU is selected. PRESSURE PLATEAU limits peak airway pressure to the PLATEAU level for the duration of an inspiratory cycle. The PRESSURE PLATEAU value is automatically referenced 10 cm H_20 below the HIGH PRESSURE ALARM/PEAK INSPIRATORY PRESSURE RELIEF Control setting (see section entitled USING PRESSURE PLATEAU).

SYNCHRONIZED INTERMITTENT MANDATORY VENTILATION (SIMV)

SIMV permits patients to breathe spontaneously while periodically receiving ventilator-generated assisted breaths. Microprocessor control of the disposable ventilator circuits' expiration valve determines which breaths are spontaneously entrained and which are mechanically delivered. FIO_2 is determined by the AIR/OXYGEN MIXER setting. Spontaneously breathing patients are allowed to entrain breathing gas, assuming the entire work-of-breathing for each spontaneous breath, at their own rate/inspiratory time. Assisted breaths are delivered as determined by the VENTILATION RATE, INSPIRATORY TIME/I:E RATIO, and TIDAL VOLUME control settings. Assisted breaths are synchronized to the patients ventilatory effort. However, if the patient does not breathe within the assisted breath "time window", a controlled breath is delivered to insure that the prescribed number of mandatory breaths are received.

Should the patient become apneic in the SIMV mode, Uni-Vent will activate its APNEA Alarm and automatically begin controlled ventilations at its current VENTILATION RATE/INSPIRATORY TIME/TIDAL VOLUME control settings or 12 ventilations per minute/INSPIRATORY TIME/TIDAL VOLUME control settings - whichever is greater (see section entitled CONTROL VENTILATION DURING APNEA; *APNEA DURING ACV OR SIMV OPERA TION).*

SIMV operation is permitted in combination with PEEP and/or SIGH, or PEEP and/or PRESSURE PLATEAU (SIGH will become disabled whenever PRESSURE PLATEAU is selected).

The following steps are required to initiate SIMV operation:

1. Turn MODE Selector Switch to SIMV. Allow SELF-CHECK tests to complete. Perform TRANSDUCER CALIBRATION if required (see section entitled TRANSDUCER CALIBRATION).

DO NOT connect disposable patient circuit to patient during SELF-CHECK.

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setting, which increases delivered volume by 50%. As a safety precaution, Uni-Vent does not allow the inspiratory portion of a SIGH breath to exceed 3seconds.

6. Press PLATEAU Pushbutton Switch if ACV operation with PRESSURE PLATEAU is required. SIGH is automatically disabled (OFF) when PLATEAU is selected. PRESSURE PLATEAU limits peak airway pressure to the PLATEAU level for the duration of an inspiratory cycle. The PRESSURE PLATEAU value is automatically referenced 10 cm H_20 below the HIGH PRESSURE ALARM/PEAK INSPIRATORY PRESSURE RELIEF Control setting (see section entitled USING PRESSURE PLATEAU).

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SIMV permits patients to breathe spontaneously while periodically receiving ventilator-generated assisted breaths. Microprocessor control of the disposable ventilator circuits' expiration valve determines which breaths are spontaneously entrained and which are mechanically delivered. FIO_2 is determined by the AIR/OXYGEN MIXER setting. Spontaneously breathing patients are allowed to entrain breathing gas, assuming the entire work-of-breathing for each spontaneous breath, at their own rate/inspiratory time. Assisted breaths are delivered as determined by the VENTILATION RATE, INSPIRATORY TIME/I:E RATIO, and TIDAL VOLUME control settings. Assisted breaths are synchronized to the patients ventilatory effort. However, if the patient does not breathe within the assisted breath "time window", a controlled breath is delivered to insure that the prescribed number of mandatory breaths are received.

Should the patient become apneic in the SIMV mode, Uni-Vent will activate its APNEA Alarm and automatically begin controlled ventilations at its current VENTILATION RATE/INSPIRATORY TIME/TIDAL VOLUME control settings or 12 ventilations per minute/INSPIRATORY TIME/TIDAL VOLUME control settings - whichever is greater (see section entitled CONTROL VENTILATION DURING APNEA; *APNEA DURING ACV OR SIMV OPERA TION).*

SIMV operation is permitted in combination with PEEP and/or SIGH, or PEEP and/or PRESSURE PLATEAU (SIGH will become disabled whenever PRESSURE PLATEAU is selected).

The following steps are required to initiate SIMV operation:

1. Turn MODE Selector Switch to SIMV. Allow SELF-CHECK tests to complete. Perform TRANSDUCER CALIBRATION if required (see section entitled TRANSDUCER CALIBRATION).

DO NOT connect disposable patient circuit to patient during SELF-CHECK.

When SELF-CHECK is completed, SIMV cycling begins automatically The INSPIRATION/EXHALATION Indicator will toggle accordingly during the inspiratory and expiratory cycles of each ventilation.

NOTE: When SIMV cycling begins, the DISCONNECT ALARM will activate. This alarm will remain active until the disposable ventilator circuit is connected to the patient (see Step 3, below) and the pressure transducer detects a pressure rise during the next ventilator generated breath, or the ALARM MUTE/CANCEL Pushbutton Switch is pressed.

2. Adjust the VENTILATION RATE (SIMV RATE), INSPIRATION TIME/I:E RATIO, TIDAL VOLUME, AIR/OXYGEN MIXER, LOW and HIGH AIRWAY PRESSURE ALARM Control settings as required. If LOW and HIGH AIRWAY PRESSURE ALARM's are not used, set their respective controls to 0 and 100.

   During SIMV operation, mandatory breaths are delivered according to Uni-Vent's VENTILATION RATE, INSPIRATION TIME and TIDAL VOLUME control settings. When the mandatory breath is scheduled, UniVent's trigger becomes momentarily armed so that it may synchronize with the patient's next inspiration. If there is no inspiratory effort during this period, a controlled breath is delivered regardless of patient effort.

   During SIMV operation, mandatory breaths are delivered at the INSPIRATION TIME and TIDAL VOLUME settings.

3. Attach disposable ventilator circuit to patient's endotracheal or tracheostomy tube. Spontaneous breathing should cause the ventilator to trigger an assisted breath and cancel the DISCONNECT Alarm. A ventilator-generated controlled breath will also cause the DISCONNECT Alarm to cancel. The INSPIRATION/EXHALATION Indicator will continue to toggle during the inspiratory and expiratory cycle of each ventilation.
4. If PEEP is required, repeatedly press PEEP Pushbutton Switch until desired setting appears in LCD. (See section entitled USING POSITIVE END EXPIRATORY PRESSURE for complete instructions).

5. Press SIGH Pushbutton Switch if SIMV operation with SIGH is required. SIGH ventilations are delivered once every 100 ventilations or 7-minutes, whichever occurs first. Each SIGH ventilation equals 150% of the INSPIRATION TIME setting, which increases delivered volume by 50%. As a safety precaution, Uni-Vent does not allow a SIGH breath to exceed 3-seconds.

6. Press PLATEAU Pushbutton Switch if SIMV operation with PRESSURE PLATEAU is required. SIGH is automatically disabled (OFF) when PLATEAU is selected. PRESSURE PLATEAU limits peak airway pressure to the PLATEAU level for the duration of an inspiratory cycle. The PRESSURE PLATEAU value is automatically referenced 10 cm H_20 below the HIGH PRESSURE ALARM/PEAK INSPIRATORY PRESSURE RELIEF Control setting (see section entitled USING PRESSURE PLATEAU).

When SELF-CHECK is completed, SIMV cycling begins automatically The INSPIRATION/EXHALATION Indicator will toggle accordingly during the inspiratory and expiratory cycles of each ventilation.

NOTE: When SIMV cycling begins, the DISCONNECT ALARM will activate. This alarm will remain active until the disposable ventilator circuit is connected to the patient (see Step 3, below) and the pressure transducer detects a pressure rise during the next ventilator generated breath, or the ALARM MUTE/CANCEL Pushbutton Switch is pressed.

2. Adjust the VENTILATION RATE (SIMV RATE), INSPIRATION TIME/I:E RATIO, TIDAL VOLUME, AIR/OXYGEN MIXER, LOW and HIGH AIRWAY PRESSURE ALARM Control settings as required. If LOW and HIGH AIRWAY PRESSURE ALARM's are not used, set their respective controls to 0 and 100.

   During SIMV operation, mandatory breaths are delivered according to Uni-Vent's VENTILATION RATE, INSPIRATION TIME and TIDAL VOLUME control settings. When the mandatory breath is scheduled, UniVent's trigger becomes momentarily armed so that it may synchronize with the patient's next inspiration. If there is no inspiratory effort during this period, a controlled breath is delivered regardless of patient effort.

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3. Attach disposable ventilator circuit to patient's endotracheal or tracheostomy tube. Spontaneous breathing should cause the ventilator to trigger an assisted breath and cancel the DISCONNECT Alarm. A ventilator-generated controlled breath will also cause the DISCONNECT Alarm to cancel. The INSPIRATION/EXHALATION Indicator will continue to toggle during the inspiratory and expiratory cycle of each ventilation.
4. If PEEP is required, repeatedly press PEEP Pushbutton Switch until desired setting appears in LCD. (See section entitled USING POSITIVE END EXPIRATORY PRESSURE for complete instructions).

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6. Press PLATEAU Pushbutton Switch if SIMV operation with PRESSURE PLATEAU is required. SIGH is automatically disabled (OFF) when PLATEAU is selected. PRESSURE PLATEAU limits peak airway pressure to the PLATEAU level for the duration of an inspiratory cycle. The PRESSURE PLATEAU value is automatically referenced 10 cm H_20 below the HIGH PRESSURE ALARM/PEAK INSPIRATORY PRESSURE RELIEF Control setting (see section entitled USING PRESSURE PLATEAU).

CONTINUOUS POSITIVE AIRWAY PRESSURE (CPAP)

CPAP operation is similar to SIMV with PEEP, except the mandatory rate is "zero". There are no assisted ventilations. The VENTILATOR RATE BECOMES "zero" and its setpoint indicator blanks. CPAP permits the patient to breathe spontaneously with PEEP. Each spontaneous breath causes a negative pressure deflection. When the trigger point is reached (2.0 cm H_20 below end pressure), Uni-Vent causes gas to flow at a default rate of 60 LPM until a back pressure of PEEP +5 cm H_20 is sensed (unconditional end-of-inspiration) or, 3-seconds have elapsed (time out), whichever occurs first. The Spontaneous Flow rate can be changed to a lesser flow rate, for current use, until operating power is turned OFF (see section entitled USER PROGRAMS, SET SPONTANEOUS FLOW). $FI0_2$ is equal to the AIR/OXYGEN MIXER setpoint. PRESSURE PLATEAU and SIGH are disabled (OFF) during CPAP operation.

An APNEA Alarm activates when there is no spontaneous breathing for I 0-seconds (based on a 3 0-second moving average). If the spontaneous breathing rate falls to 6 BPM (or less), control ventilation during APNEA will begin (see section entitled CONTROL VENTILATION DURING APNEA; *APNEA DURING CPAP OPERATION).*

CONTROL VENTILATION DURING APNEA

When apnea is detected during ACV, SIMV, or CPAP operation, Uni-Vent's microprocessor generates an APNEA Alarm and initiates controlled ventilation breathing to protect your patient. Control settings that were displayed prior to APNEA will remain displayed, but ignored, during these CONTROL VENTILATIONS.

APNEA DURING ACV OR SIMV OPERATION - Controlled ventilation occurs when the period between positive and/or negative pressure deflections (spontaneous and/or Uni-Vent generated ventilations) exceeds 19-seconds minus INSPIRATION TIME setting. Monitoring for APNEA is disabled during an INVERSE LE Alarm. UniVent will provide your patient, from the following two alternatives, the one which offers the highest ventilation rate.

1. Control panel settings for VENTILATION RATE, INSPIRATION TIME and TIDAL VOLUME or;
2. A default VENTILATION RATE of 12 ventilations per minute and the control panel INSPIRATION TIME and TIDAL VOLUME Control settings.

   NOTE: To prevent a potential lockout of the APNEA backup, Eagle will create a 1:2 I:E Ratio at the onset of APNEA if its current Inspiratory Time setting would result in an Inverse I:E condition.

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CONTINUOUS POSITIVE AIRWAY PRESSURE (CPAP)

CPAP operation is similar to SIMV with PEEP, except the mandatory rate is "zero". There are no assisted ventilations. The VENTILATOR RATE BECOMES "zero" and its setpoint indicator blanks. CPAP permits the patient to breathe spontaneously with PEEP. Each spontaneous breath causes a negative pressure deflection. When the trigger point is reached (2.0 cm H_20 below end pressure), Uni-Vent causes gas to flow at a default rate of 60 LPM until a back pressure of PEEP +5 cm H_20 is sensed (unconditional end-of-inspiration) or, 3-seconds have elapsed (time out), whichever occurs first. The Spontaneous Flow rate can be changed to a lesser flow rate, for current use, until operating power is turned OFF (see section entitled USER PROGRAMS, SET SPONTANEOUS FLOW). $FI0_2$ is equal to the AIR/OXYGEN MIXER setpoint. PRESSURE PLATEAU and SIGH are disabled (OFF) during CPAP operation.

An APNEA Alarm activates when there is no spontaneous breathing for I 0-seconds (based on a 3 0-second moving average). If the spontaneous breathing rate falls to 6 BPM (or less), control ventilation during APNEA will begin (see section entitled CONTROL VENTILATION DURING APNEA; *APNEA DURING CPAP OPERATION).*

CONTROL VENTILATION DURING APNEA

When apnea is detected during ACV, SIMV, or CPAP operation, Uni-Vent's microprocessor generates an APNEA Alarm and initiates controlled ventilation breathing to protect your patient. Control settings that were displayed prior to APNEA will remain displayed, but ignored, during these CONTROL VENTILATIONS.

APNEA DURING ACV OR SIMV OPERATION - Controlled ventilation occurs when the period between positive and/or negative pressure deflections (spontaneous and/or Uni-Vent generated ventilations) exceeds 19-seconds minus INSPIRATION TIME setting. Monitoring for APNEA is disabled during an INVERSE LE Alarm. UniVent will provide your patient, from the following two alternatives, the one which offers the highest ventilation rate.

1. Control panel settings for VENTILATION RATE, INSPIRATION TIME and TIDAL VOLUME or;
2. A default VENTILATION RATE of 12 ventilations per minute and the control panel INSPIRATION TIME and TIDAL VOLUME Control settings.

   NOTE: To prevent a potential lockout of the APNEA backup, Eagle will create a 1:2 I:E Ratio at the onset of APNEA if its current Inspiratory Time setting would result in an Inverse I:E condition.

APNEA DURING CPAP OPERATION - Controlled ventilation occurs when no spontaneous breathing is detected for 10-seconds. Controlled ventilations will have the following characteristics:

Mechanical rate = 12 breaths per minute
I:E ratio = 1:2
Tidal Volume = Will vary with patient. Uni-Vent will deliver gas at a flow rate of 30 liters per minute until a peak inspiratory pressure of 40 cm H_20 is reached.

Depressing the ALARM MUTE/CANCEL Pushbutton Switch cancels the APNEA Alarm, stops CONTROL VENTILATION DURING APNEA and restarts ACV, SIMV or CPAP operation to current control panel settings.

USING POSITIVE END EXPIRATORY PRESSURE (PEEP)

The Model 754/754M is capable of internally controlling PEEP. A separate PEEP valve is not required and **must not** be added to the disposable patient circuit. The PEEP function provides a means of converting the transducer calibration pressure reference from atmospheric pressure to atmospheric pressure + PEEP pressure. PEEP may be used during ACV, SIMV, or CPAP operation.

When the ventilator is turned ON, PEEP has a default value of 0 (OFF). A PEEP value can be manually entered using the PEEP OFF/ON-SET Pushbutton Switch. To set a value of PEEP, simply press the PEEP OFF/ON-SET Pushbutton Switch. Each time this switch is pressed, the value of PEEP will increase by 1 cm H_20. A maximum PEEP value of 20 cm H_20 is possible. Pressing the PEEP OFF/ON-SET Pushbutton Switch when a current value of 20 exists, returns the value to 0. The PEEP setpoint value can be made to scroll upwards by putting continuous pressure on the PEEP OFF/ON-SET Pushbutton Switch until the desired value is reached.

Default trigger sensitivity is referenced to end pressure and will trigger between 1.5 to 2.0 cm H_20 below the end pressure value (see section entitled USER PROGRAMS).

APNEA DURING CPAP OPERATION - Controlled ventilation occurs when no spontaneous breathing is detected for 10-seconds. Controlled ventilations will have the following characteristics:

Mechanical rate = 12 breaths per minute
I:E ratio = 1:2
Tidal Volume = Will vary with patient. Uni-Vent will deliver gas at a flow rate of 30 liters per minute until a peak inspiratory pressure of 40 cm H_20 is reached.

Depressing the ALARM MUTE/CANCEL Pushbutton Switch cancels the APNEA Alarm, stops CONTROL VENTILATION DURING APNEA and restarts ACV, SIMV or CPAP operation to current control panel settings.

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Default trigger sensitivity is referenced to end pressure and will trigger between 1.5 to 2.0 cm H_20 below the end pressure value (see section entitled USER PROGRAMS).

Uni-Vent's CPU monitors PEEP. If PEEP pressure attempts to rise during its plateau, Uni-Vent causes the exhalation valve to open, allowing pressure to fall to zero. Should an inspiration cycle begin before end pressure plateaus, a HIGH PEEP alarm will sound.

The airway pressure waveform displayed in the LCD is an accurate representation of proximal airway pressure. Large expiratory pressure changes that occur within a short period of time create temporary pressure gradients between the patient's lungs and the proximal airway pressure sensor. Unless PEEP is used, this condition is not apparent because equalization of positive pressures does not occur with a "zero" baseline. Compliance and resistance effect exhalation time. Patients with higher airway resistance will momentarily alter the exhalation waveform appearance by causing a greater pressure differential between the lungs and ventilator circuit.

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UniVent's PEEP circuitry and software attempt to learn the patient's expiratory characteristic. Learning is an ongoing process and fine adjustments can be made to each breath as required. By doing so, pressure "undershoot" caused by gradient differences is minimized, or eliminated altogether. The initial learning process typically takes from 1 to 6 breaths. During this process, a temporary PEEP "baseline" is established for each breath so that triggering sensitivity is not decreased.

The LCD display area for PEEP is on the top line, immediately below its respective pushbutton switch. The PEEP OFF/ON-SET display will blank when a SYSTEM FAILURE Alarm occurs.

USING PRESSURE PLATEAU

When the ventilator is turned ON, PLATEAU is OFF (its default value). It becomes operable, only in the ACV and SIMV operating modes, by pressing the PRESSURE PLATEAU OFF/ON Pushbutton Switch. The PLATEAU value is automatically referenced 10 cm H_20 below the HIGH PRESSURE ALARMIPEAK INSPIRATORY

PRESSURE RELIEF Control setpoint. PRESSURE PLATEAU has an absolute range of 5 to 90 cm H_20.

When a PLATEAU value is reached, gas flow is alternately cycled OFF and ON, to maintain the PLATEAU, until the inspiratory cycle is completed. If inspiratory pressure attempts to rise above the HIGH PRESSURE ALARMIPEAK INSPIRATORY PRESSURE RELIEF Control setting, Uni-Vent will open the exhalation valve until pressure falls to the PLATEAU level. If Uni-Vent detects a leak in its disposable patient circuit, or any of its connections, additional gas flow is allowed to maintain the PLATEAU.

The LCD display area for PRESSURE PLATEAU is on the top line, immediately below its respective pushbutton switch. The PRESSURE PLATEAU display will blank when a SYSTEM FAILURE Alarm occurs.

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PRESSURE RELIEF Control setpoint. PRESSURE PLATEAU has an absolute range of 5 to 90 cm H_20.

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The LCD display area for PRESSURE PLATEAU is on the top line, immediately below its respective pushbutton switch. The PRESSURE PLATEAU display will blank when a SYSTEM FAILURE Alarm occurs.

BACKUP VENTILATOR

Eagle TM contains a backup ventilator that is designed to provide a limited degree of operation should a CPU failure occur. A CPU failure is a hardware-detected computer failure that will trigger a SYSTEM FAILURE Alarm. Normal operation will stop, the LCD will blank, the ALARM LED illuminates (flashing), the SYSTEM FAILURE LED illuminates (non-flashing) and a pulsing tone is heard. A SYSTEM FAILURE, that is caused by a CPU failure, will illuminate the SYSTEM FAILURE LED because the causing condition cannot assure safe operation of the primary Eagle ventilator. In such cases, a separate ventilator circuit embedded within the Eagle , begins automatic operation. Its operating characteristics are as follows:

Rate:	12 Breaths Per Minute
I:E Ratio:	1:2 (1.67-seconds x 3.33-seconds)
Flow Rate:	30 Liters Per Minute for duration of Inspiratory Time or until Peak Inspiratory Pressure threshold is reached
Peak Inspiratory Pressure Relief-	40 cm H_20
Gas Source Prioritization:	External Air, if available; or Internal Compressor, if operable; or External Oxygen, if available
Audible System Failure Alarm Mute/Cancel:	Pressing ALARM MUTE/CANCEL pushbutton switch cancels audible alarm
Manual Trigger Override:	Yes, followed by a 6-second reset period before automatic ventilation resumes

NOTE: A SYSTEM FAILURE that is caused by patient circuit pressure exceeding 40 cm H_20 for 5-seconds, continuously, will not cause the BACKUP VENTILATOR to activate. Instead, the ALARM LED illuminates (flashing), the SYSTEM FAILURE LED illuminates (non-flashing), a non-mutable continuous tone is heard, and the patient circuit exhalation valve is latched open-to-atmosphere.

HUMIDIFIERS AND HEAT MOISTURE EXCHANGERS (HME'S)

The Model 754/754M may be operated with a humidifier or heat moisture exchanger. Humidifiers should be connected and operated in accordance with directions provided by its manufacturer. **Humidifiers are not recommended for use in transport**. Observe all safety and cautionary statements.

HME's, sometimes referred to as "artificial noses", are not position-sensitive, and are recommended for transport applications. While HME's may not be suitable for all applications, they facilitate portability in a way that conventional humidifiers cannot. Choose an HME carefully. Look for one that is lightweight and has minimal dead-space and minimal resistance to flow. HME's attach between the disposable ventilator circuit and patient's endotracheal tube.

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Gas Source Prioritization:	External Air, if available; or Internal Compressor, if operable; or External Oxygen, if available
Audible System Failure Alarm Mute/Cancel:	Pressing ALARM MUTE/CANCEL pushbutton switch cancels audible alarm
Manual Trigger Override:	Yes, followed by a 6-second reset period before automatic ventilation resumes

NOTE: A SYSTEM FAILURE that is caused by patient circuit pressure exceeding 40 cm H_20 for 5-seconds, continuously, will not cause the BACKUP VENTILATOR to activate. Instead, the ALARM LED illuminates (flashing), the SYSTEM FAILURE LED illuminates (non-flashing), a non-mutable continuous tone is heard, and the patient circuit exhalation valve is latched open-to-atmosphere.

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OPERATOR PERFORMANCE CHECKS

Before placing this instrument into operation, the operator can perform various operational checks to insure proper performance.

1. Verify operating power selections.
2. When using external power source (from Universal AC Power Supply, or 12 VDC Power Cable) insure that LCD display verifies presence of external power and fuses are not blown or missing.
3. Verify successful completion of SELF-CHECK.
4. Insure that all hoses, tubing and fittings are properly connected.

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SPECIFICATIONS

OPERATING MODES:
ACV - with/without PEEP, with/without SIGH
ACV - with/without PEEP, with/without PRESSURE PLATEAU
SIMV - with/without PEEP, with/without SIGH
SIMV - with/without PEEP, with/without PRESSURE PLATEAU
CPAP - with/without PEEP
Control Ventilation - for APNEA backup of ACV, SIMV and CPAP

FLOW RATE: Adjustable, 0 to approximately 60 LPM (0 to approximately 1000 ml/SEC)
VENTILATION RATE: Adjustable, 1 to 150 breaths per minute, resolution 1 breath per minute (+/- 1 digit on the LCD)
INSPIRATION TIME: Adjustable, 0.1 to 3.0 seconds, resolution in 0.1 second increments (+/- 1 digit on the LCD); 1:2 I:E RATIO Preset
F102: Adjustable, 21 % to 100%, resolution in 1 % increments, accurate to within +/- 10%
LOW PRESSURE ALARM: Adjustable, 0 to 50 cm H_20, resolution in 1 cm H_20 increments (+/- 1 digit on the LCD)
*HIGH PRESSURE ALA*RM: Adjustable, 15 to 100 cm H_20, resolution in 1 cm H_20 increments (+/- 1 digit on the LCD)
PEAK INSPIRATORY PRESSURE RELIEF: Adjustable, 15 to 100 cm H_20, resolution in 1 cm H_20 increments (+/- 1 digit on the LCD)
PRESSURE PLATEAU: Range, 5 to 90 cm H_20 (referenced to HIGH PRESSURE ALARM setpoint)
ASSIST/SIMV SENSITIVITY: Default, 1.5 to 2.0 cm H_20 below end pressure (see USER PROGRAMS)
PEEP: Program range 1 to 20 cm H_20, resolution in 1 cm H_20 increments (+/- 1 digit on the LCD)
SIGH: Occurs once every 100-ventilations or 7-minutes, whichever occurs first. SIGH duration = 150% of inspiration time (truncated to a combined maximum of 3-seconds)
Liquid Crystal Display: EXTERNAL AIR, SIGH, PEEP, PRESSURE PLATEAU, HIGH PRESSURE ALARM SETTING, LOW PRESSURE ALARM SETTING, VENTILATION RATE, INSPIRATION TIME/I:E RATIO, TIDAL VOLUME, AIR/OXYGEN MIXER, MODE, INSPIRATION/EXHALATION, POWER, PEAK AIRWAY PRESSURE, MEAN AIRWAY PRESSURE, DIGITAL BAR GRAPH, HIGH/LOW, AIRWAY PRESSURE ALARM SETPOINT INDICATORS, Paw
LED INDICATOR: CHARGE
LCD DIGITAL BAR GRAPH: Range -10 to 100 cm H_20
LCD ALARM DISPLAY: BATTERY LOW, EXTERNAL POWER LOW, LOW PRESSURE, 02 LOW/FAIL, DISCONNECT, HIGH PRESSURE, APNEA, VT, HIGH PEEP, EXT AIR LOW/FAIL, FIO2, INVERSE I/E, COMP, PRESSURE ALARM SETTINGS, TRANSDUCER CALIBRATION ABORT, SYSTEM FAILURE, VENTILATOR FAIL, INSPIRATION TIME TRUNCATED TO 3-SEC, PLATEAU VOLUME,

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SPECIFICATIONS

OPERATING MODES:
ACV - with/without PEEP, with/without SIGH
ACV - with/without PEEP, with/without PRESSURE PLATEAU
SIMV - with/without PEEP, with/without SIGH
SIMV - with/without PEEP, with/without PRESSURE PLATEAU
CPAP - with/without PEEP
Control Ventilation - for APNEA backup of ACV, SIMV and CPAP

FLOW RATE: Adjustable, 0 to approximately 60 LPM (0 to approximately 1000 ml/SEC)
VENTILATION RATE: Adjustable, 1 to 150 breaths per minute, resolution 1 breath per minute (+/- 1 digit on the LCD)
INSPIRATION TIME: Adjustable, 0.1 to 3.0 seconds, resolution in 0.1 second increments (+/- 1 digit on the LCD); 1:2 I:E RATIO Preset
F102: Adjustable, 21 % to 100%, resolution in 1 % increments, accurate to within +/- 10%
LOW PRESSURE ALARM: Adjustable, 0 to 50 cm H_20, resolution in 1 cm H_20 increments (+/- 1 digit on the LCD)
*HIGH PRESSURE ALA*RM: Adjustable, 15 to 100 cm H_20, resolution in 1 cm H_20 increments (+/- 1 digit on the LCD)
PEAK INSPIRATORY PRESSURE RELIEF: Adjustable, 15 to 100 cm H_20, resolution in 1 cm H_20 increments (+/- 1 digit on the LCD)
PRESSURE PLATEAU: Range, 5 to 90 cm H_20 (referenced to HIGH PRESSURE ALARM setpoint)
ASSIST/SIMV SENSITIVITY: Default, 1.5 to 2.0 cm H_20 below end pressure (see USER PROGRAMS)
PEEP: Program range 1 to 20 cm H_20, resolution in 1 cm H_20 increments (+/- 1 digit on the LCD)
SIGH: Occurs once every 100-ventilations or 7-minutes, whichever occurs first. SIGH duration = 150% of inspiration time (truncated to a combined maximum of 3-seconds)
Liquid Crystal Display: EXTERNAL AIR, SIGH, PEEP, PRESSURE PLATEAU, HIGH PRESSURE ALARM SETTING, LOW PRESSURE ALARM SETTING, VENTILATION RATE, INSPIRATION TIME/I:E RATIO, TIDAL VOLUME, AIR/OXYGEN MIXER, MODE, INSPIRATION/EXHALATION, POWER, PEAK AIRWAY PRESSURE, MEAN AIRWAY PRESSURE, DIGITAL BAR GRAPH, HIGH/LOW, AIRWAY PRESSURE ALARM SETPOINT INDICATORS, Paw
LED INDICATOR: CHARGE
LCD DIGITAL BAR GRAPH: Range -10 to 100 cm H_20
LCD ALARM DISPLAY: BATTERY LOW, EXTERNAL POWER LOW, LOW PRESSURE, 02 LOW/FAIL, DISCONNECT, HIGH PRESSURE, APNEA, VT, HIGH PEEP, EXT AIR LOW/FAIL, FIO2, INVERSE I/E, COMP, PRESSURE ALARM SETTINGS, TRANSDUCER CALIBRATION ABORT, SYSTEM FAILURE, VENTILATOR FAIL, INSPIRATION TIME TRUNCATED TO 3-SEC, PLATEAU VOLUME,

PREVENTATIVE MAINTENANCE DUE, VT SETTINGS, EXTENDED NON-USE/STORAGE, EXTERNAL POWER FAILURE, TOTAL FLOW BACKUP

*LED ALARM INDIC*ATORS: ALARM, SYSTEM FAILURE

ALARM VOLUME: 80 dBA @I ft

MANUAL BREATH/TRIGGER: Yes

NOISE LEVEL: Less than 80 dBA when measured @I -meter (compressor operating)

OPERATING VOLTAGES:

Ventilator: 11 - 15 volts, DC (negative ground)

Universal AC Power Supply: Model 754 (standard) - Input: 90 to 265 VAC, 47-440 HZ, autosensing Model 754 (optional), Model 754M (standard) AC Input: 115/230 Volts, +/-10%; 50-400 HZ, +/-2%, autosensing DC Input: 16-30 Volts (DC-DC (

OPERATING TIME:

Internal Batteries: 3-hours, maximum, using internal compressor; 12-hours using external gas

External AC: Continuous

External DC: Continuous

TEMPERATURE RANGES:

OPERATING: -60°C to 60°C (-76°F to 140°F)

CHARGING: -20°C to 50°C (-4°F to 122°F)

LONG TERM STORAGE: 10°C to 30°C (50°F to 80°F)

SIZE:

Ventilation System 8.87" Wide X 11.5" High X 4.5" Deep (22.55 cm Wide X 29.21 cm High X 11.43 cm Deep)

AC Power Supply (std) 8.75" Wide X 2.25" High X 5.75" Deep (22.23 cm Wide X 5.71 cm High X 14.61

AC Power Supply (opt) 8.75" Wide X 3.63" High X 5.75" Deep (22.23 cm Wide X 9.22 cm High X 14.61 cm Deep)

WEIGHT:

Ventilation System 13 lbs (5.8 Kg)

AC Power Supply (std) 3.00 lbs (1.36 Kg)

AC Power Supply (opt) 6.75 lbs (3.07 Kg)

WARRANTY: Limited, I -year (see LIMITED WARRANTY statement)

PREVENTATIVE MAINTENANCE DUE, VT SETTINGS, EXTENDED NON-USE/STORAGE, EXTERNAL POWER FAILURE, TOTAL FLOW BACKUP

*LED ALARM INDIC*ATORS: ALARM, SYSTEM FAILURE

ALARM VOLUME: 80 dBA @I ft

MANUAL BREATH/TRIGGER: Yes

NOISE LEVEL: Less than 80 dBA when measured @I -meter (compressor operating)

OPERATING VOLTAGES:

Ventilator: 11 - 15 volts, DC (negative ground)

Universal AC Power Supply: Model 754 (standard) - Input: 90 to 265 VAC, 47-440 HZ, autosensing Model 754 (optional), Model 754M (standard) AC Input: 115/230 Volts, +/-10%; 50-400 HZ, +/-2%, autosensing DC Input: 16-30 Volts (DC-DC

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WARRANTY: Limited, I -year (see LIMITED WARRANTY statement)

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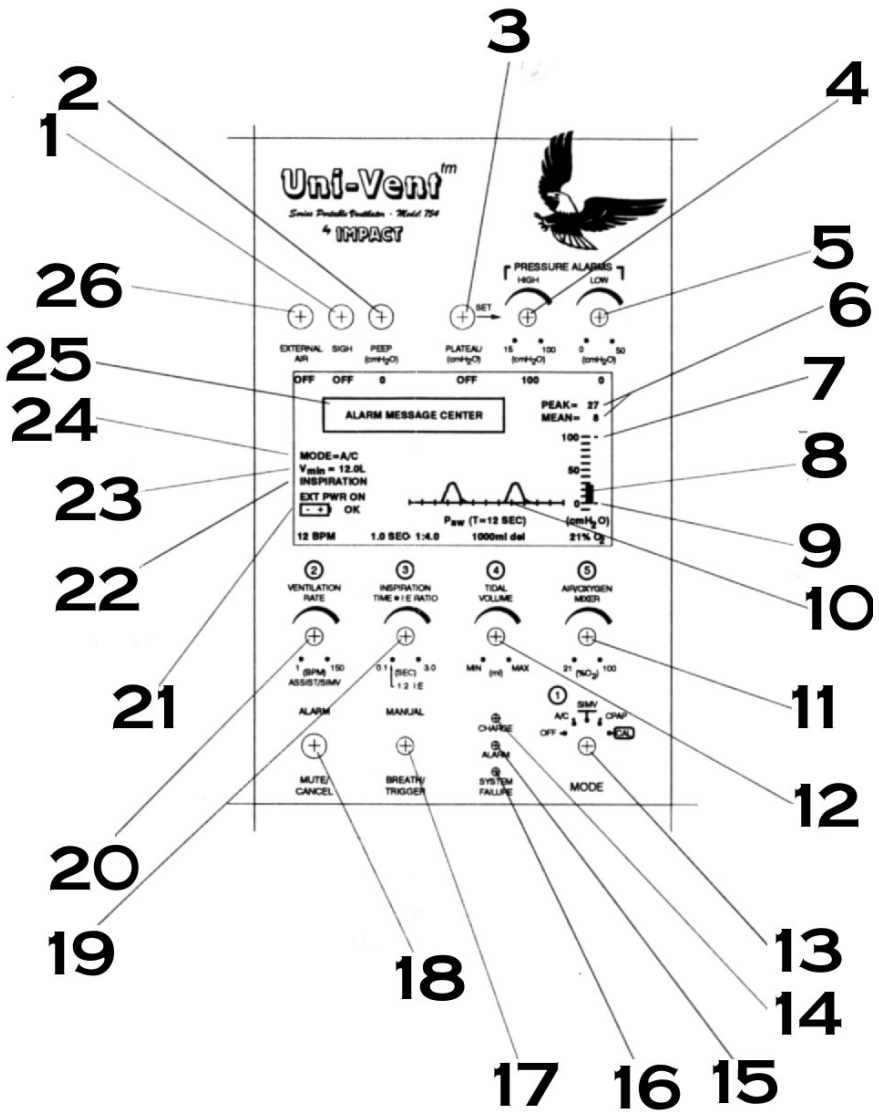

Uni-Vent Eagle Model 754M Portable Ventilator: Description of Controls and Indicators

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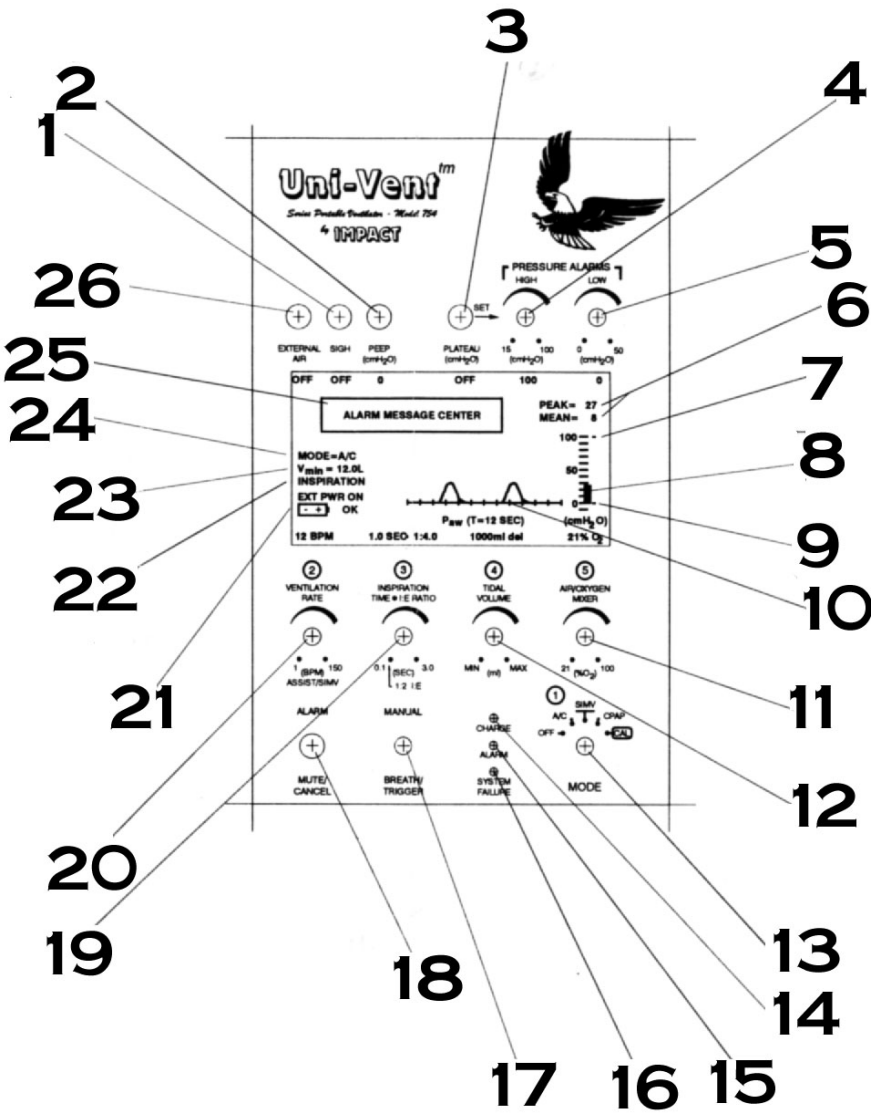

Uni-Vent Eagle Model 754M Portable Ventilator: Description of Controls and Indicators

1. **SIGH OFF/ON Pushbutton Switch:** Default value is OFF. When set to ON, first breath delivered is a SIGH, then once every 100-breaths or 7-minutes (whichever occurs first). Each SIGH equals 150% of Inspiration Time setting, delivered volume is increased by 50%. Status displayed in LCD (beneath Pushbutton Switch).

2. **PEEP OFF/ON SET Pushbutton Switch:** Sets internally-generated PEEP setpoint. Default value is OFF. Range is from 0 to 20 cm H_2O. Value increases by 1, each time pushbutton is pressed. Value displayed in LCD (beneath Pushbutton Switch.

3. **PRESSURE PLATEAU OFF/ON Pushbutton Switch:** Default value is OFF. When switch is pressed, PLATEAU value is automatically referenced 10 cm H_2O less than HIGH PRESSURE ALARM/PEAK INSPIRATORY PRESSURE RELIEF Control setpoint. Plateau range is 5-90 cm H_2O. Value displayed in LCD (beneath Pushbutton Switch).

4. **HIGH PRESSURE ALARM/PEAK INSPIRATORY PRESSURE RELIEF Control:** Sets threshold value for High Pressure Alarm/Peak Inspiratory Pressure Relief. Range is 15-100 cm H_2O. Default is current position of Control. Activates when inspiratory pressure exceeds setpoint any time during 4-consecutive ventilations. Value displayed in LCD (beneath Control).

5. **LOW PRESSURE ALARM Control:** Sets threshold value of Low Pressure Alarm. Range is 0-50 cm H_2O. Default is current position of Control. Activates when inspiratory pressure does not exceed setpoint at any time during 2-consecutive ventilations. Value displayed in LCD (beneath Control).

6. **PEAK and MEAN AIRWAY PRESSURE Indicators:** Display the Peak and Mean Airway Pressure of the previous breath.

7. **HIGH AIRWAY PRESSURE ALARM Setpoint Indicator:** Indicates current setting of the HIGH PRESSURE ALARM Control adjacent to the Digital Bar Graph.

8. **DIGITAL BAR GRAPH Indicator:** Provides continuous display of airway pressure. Range is from –10 to 100 cm H_2O, vertical resolution of 2 cm H_2O/bar.

9. **LOW AIRWAY PRESSURE ALARM Setpoint Indicator:** Indicates current setting of LOW PRESSURE ALARM Control adjacent to Digital Bar Graph.

10. **P_{aw} Indicator:** Displays the most recent 12-seconds of airway pressure information. Vertical axis is calibrated to coincide with adjacent Digital Bar Graph. Horizontal axis is calibrated in 1-second intervals.

1. **SIGH OFF/ON Pushbutton Switch:** Default value is OFF. When set to ON, first breath delivered is a SIGH, then once every 100-breaths or 7-minutes (whichever occurs first). Each SIGH equals 150% of Inspiration Time setting, delivered volume is increased by 50%. Status displayed in LCD (beneath Pushbutton Switch).

2. **PEEP OFF/ON SET Pushbutton Switch:** Sets internally-generated PEEP setpoint. Default value is OFF. Range is from 0 to 20 cm H_2O. Value increases by 1, each time pushbutton is pressed. Value displayed in LCD (beneath Pushbutton Switch.

3. **PRESSURE PLATEAU OFF/ON Pushbutton Switch:** Default value is OFF. When switch is pressed, PLATEAU value is automatically referenced 10 cm H_2O less than HIGH PRESSURE ALARM/PEAK INSPIRATORY PRESSURE RELIEF Control setpoint. Plateau range is 5-90 cm H_2O. Value displayed in LCD (beneath Pushbutton Switch).

4. **HIGH PRESSURE ALARM/PEAK INSPIRATORY PRESSURE RELIEF Control:** Sets threshold value for High Pressure Alarm/Peak Inspiratory Pressure Relief. Range is 15-100 cm H_2O. Default is current position of Control. Activates when inspiratory pressure exceeds setpoint any time during 4-consecutive ventilations. Value displayed in LCD (beneath Control).

5. **LOW PRESSURE ALARM Control:** Sets threshold value of Low Pressure Alarm. Range is 0-50 cm H_2O. Default is current position of Control. Activates when inspiratory pressure does not exceed setpoint at any time during 2-consecutive ventilations. Value displayed in LCD (beneath Control).

6. **PEAK and MEAN AIRWAY PRESSURE Indicators:** Display the Peak and Mean Airway Pressure of the previous breath.

7. **HIGH AIRWAY PRESSURE ALARM Setpoint Indicator:** Indicates current setting of the HIGH PRESSURE ALARM Control adjacent to the Digital Bar Graph.

8. **DIGITAL BAR GRAPH Indicator:** Provides continuous display of airway pressure. Range is from –10 to 100 cm H_2O, vertical resolution of 2 cm H_2O/bar.

9. **LOW AIRWAY PRESSURE ALARM Setpoint Indicator:** Indicates current setting of LOW PRESSURE ALARM Control adjacent to Digital Bar Graph.

10. **P_{aw} Indicator:** Displays the most recent 12-seconds of airway pressure information. Vertical axis is calibrated to coincide with adjacent Digital Bar Graph. Horizontal axis is calibrated in 1-second intervals.

11. **AIR/OXYGEN MIXER Control:** Sets FiO_2 when ventilator is connected to external 50 PSI source. Range is 21-100%. Default is current position of Control. FiO_2 value displayed in LCD (above Control).

12. **TIDAL VOUME Control:** Sets Tidal Volume. Range is based on gas flow not exceeding 60 LPM (1000 ml/sec). Default value is current position of Control. Set and delivered Tidal Volume alternately displayed in LCS (above Control).

13. **MODE Selector Switch:** Applies operating power to ventilator for Assist-Control (A/C), Synchronized Intermittent Mandatory Ventilation (SIMV), Continuous Positive Airway Pressure (CPAP), or Transducer Calibration (CAL) modes.

14. **CHARGE Indicator:** Green LED, illuminates when battery recharging current is flowing. LED does not remain illuminated when battery is fully charged.

15. **ALARM Indicator:** Activates for all alarm conditions except a System Failure Alarm. Red LED flashes on/off when alarm is not muted; stays on continuously when alarm is muted. The LED indicator is accompanied by a pulsing tone that remains on until the alarm is muted.

16. **SYSTEM FAILURE Indicator:** Acitvates when CPU is forced to stop operation or a CPU failure has occurred. Red LED illuminates continuously and is accompanied by a continuous audible tone that cannot be muted. A System Failure will cause the LCD to blank.

17. **MANUAL BREATH/TRIGGER:** Delivers a Manual Breath equal to one complete ventilatory cycle in A/C and SIMV. IN CPAP, the Manual Breath delivers gas at a 30 LPM flow rate, for 1.67-seconds, pressure limited to 40 cm H_2O. The Manual Trigger is operational when a System Failure has occurred. Gas will flow at a rate of 30 LPM, pressure limited to 40 cm H_2O, for as long as the Pushbutton Switch is pressed.

18. **ALARM MUTE/CANCEL Pushbutton Switch:** The alarm category determines what effect pressing this switch will have. It will mute an audible operating alarm signal, cancel an advisory alarm signal, or cancel specific alarms such as APNEA or EXTERNAL POWER FAIL. A typical mute is 30-seconds, special alarms have longer mutes.

19. **INSPIRATION TIME I:E RATION Control:** Sets inspiratory duration for all ventilator-generated breaths. Range 0.1-3.0 seconds maximum. Usable range is limited by VENTILATION RATE Control setting (Inverse I:E is not permitted). Fully counterclockwise position enables fixed 1:2 I:E Ratio. Default is current position of Control. Combination of inspiration time and I:E Ratio is displayed in LCD (above Control).

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11. **AIR/OXYGEN MIXER Control:** Sets FiO_2 when ventilator is connected to external 50 PSI source. Range is 21-100%. Default is current position of Control. FiO_2 value displayed in LCD (above Control).

12. **TIDAL VOUME Control:** Sets Tidal Volume. Range is based on gas flow not exceeding 60 LPM (1000 ml/sec). Default value is current position of Control. Set and delivered Tidal Volume alternately displayed in LCS (above Control).

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20. **VENTILATION RATE Control:** Sets mechanical ventilation rate for A/C and SMV modes. Range is 1-150 BPM. Default is current position of Control. Value displayed in LCD (above Control).

21. **POWER INFORMATION CENTER:** A 2-line area that displays current status of external power, internal power, and fuses. The EXT PWR line blanks when the ventilator is not connected to an external power source.

22. **INSPIRATION/EXHALATION Indicator:** Alternately displays the inspiration and exhalation phase of mechanical and/or spontaneous breaths.

23. **Vmin Indicator:** Displays Minute Volume (in liters), in the A/C mode.

24. **MODE Indicator:** Displays current setting of the MODE Selector Switch.

25. **ALARM MESSAGE CENTER (AMC):** A centralized location for displaying up to 4-lines of alarm message information. Up to 2-alarms with, short messages, may be displayed simultaneously. If more than 2-alarms occur simultaneously, only the name of each alarm is displayed (as shown below in boldface).

BATTERY LOW/FAIL-RECHARGE/REPLACE BATTERY PACK
EXTERNAL POWER LOW-CHECK POWER SOURCE/CONNECTIONS
02 LOW/FAIL-CHECK OXYGEN SOURCE/CONNECTIONS
EXT AIR LOW/FAIL-CHECK AIR SOURCE/CONNECTIONS
LOW PRESSURE-PEAK INSPIRATORY PRESSURE TOO LOW
DISCONNECT-CHECK CIRCUIT CONNECTIONS
HIGH PRESSURE-PEAK INSPIRATORY PRESSURE TOO HIGH
APNEA-CHECK PATIENT FOR SPONTANEOUS BREATHING
APNEA-CPAP AVERAGE RATE LESS THAN 6-BPM
HIGH PEEP-INSPIRATION BEGAN BEFORE END PRESSURE PLATEAU
FI02-GAS MIX ERROR. CHECK SOURCE/SETTINGS/CONNECTIONS
PRESSURE ALARM SETTINGS-ALARM SETTINGS REVERSED
VT-DELIVERED TIDAL VOLUME DOES NOT EQUAL SET TIDAL VOLUME
COMP-COMPRESSOR OUTPUT LOW/FAIL
INSPIRATION TIME TRUNCATED TO 3-SEC-NOTE I-TIME & I:E
PLATEAU VOLUME-DELIVERED VOLUME LESS THAN SET VOLUME
VT SETTINGS-INSPIRATORY TIME X FLOW UNABLE TO DELIVER SET VOLUME
EXT PWR FAIL/DISCONNECT–CHECK POWER SOURCE/CONNECTIONS
TOTAL FLOW BACKUP-CONTACT CUSTOMER SERVICE
INVERSE I:E-INSPIRATORY TIME LONGER THAN EXHALATION TIME
TRANSDUCER CALIBRATION ABORT-RECALIBRATE TRANSDUCER

20. **VENTILATION RATE Control:** Sets mechanical ventilation rate for A/C and SMV modes. Range is 1-150 BPM. Default is current position of Control. Value displayed in LCD (above Control).

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TRANSDUCER CALIBRATION ABORT-RECALIBRATE TRANSDUCER

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The following alarm overrides any of the above messages when activated:
VENTILATOR FAILURE DETECTED
this alarm is followed by one of the following

FAILURE CODE 1
•SELF-CHECK FAILURE I

FAILURE CODE 2
•NO GAS AND COMPRESSOR FAILURE!

FAILURE CODE 3
•EXCESSIVE AIRWAY PRESSURE!

FAILURE CODE 4
•MEMORY CHECK FAILURE!

FAILURE CODE 5
•EXHALATION VALVE FAILURE!

FAILURE CODE 6
•EXCESSIVE NEGATIVE PRESSURE!

FAILURE CODE 7
•RUN-TIME CALIBRATION FAILURE!

26. **EXTERNAL AIR OFF/ON Pushbutton Switch:** Use with nominal 50-PSI compressed gas source. Default value is OFF. Status displayed in LCD (beneath Pushbutton Switch).

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The following alarm overrides any of the above messages when activated:
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this alarm is followed by one of the following

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ISTAT Blood Gas Analyzer

	i-STAT
Manufacturer	i-STAT Corporation
Size	2.52" X 8.26" X 2.05"
Weight	18.34 oz
Power Requirement	Two 9 V lithium batteries, minimum of 250 tests before replacement required
Cartridges	Refrigerated until expiration date, keep at room temp to 2 weeks
Analytes	Sodium (Na^+) Potassium (K^+) Chloride (Cl^-) Ionized calcium (iCa^{++}) Blood gas (P_aO_2, P_aCO_2, pH) Glucose Hematocrit BUN
Operating Temperature	16-30 ^oC
Printer	Separate
Calibration	Electronic calibration daily when not in use otherwise must do every 8 hours when in use Liquid controls weekly Calibration with each cartridge
Common Problems	**"Dead Batteries"**-replace batteries **"BAT"**-battery low, approximately 50 tests can still be done Temperature of sensor cartridge/analyzer is out of range **"Cartridge Preburst"**-calibration fluid on sensors before it should be **"Invalid or Expired CLEW"**-Standardization set expired, missing or corrupted…need to download CLEW **"SIM"**-use electronic simulator, must be done every 8 hrs

Using the i-STAT Blood Analysis System

Cartridges that require thermal control (37 ^oC) must be used with i-STAT analyzers that have the thermal control feature. A 3 ^oC symbol is printed on the analyzer case to indicate this capability. Cartridges not requiring thermal control can be used with either analyzer.

1. If the **SIM** message is displayed, run electronic calibration.

2. Remove cartridge from pouch. Handle a cartridge by its edges. Avoid touching the contact pads or exerting pressure over the center of the cartridge.

3. Direct needle, pipette tip or capillary tube into the sample well. Dispense sample until it reaches the fill mark on cartridge.

4. Fold the snap cover over the sample well until it reaches the fill mark on the cartridge.

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Operating Temperature	16-30 ^oC
Printer	Separate
Calibration	Electronic calibration daily when not in use otherwise must do every 8 hours when in use Liquid controls weekly Calibration with each cartridge
Common Problems	**"Dead Batteries"**-replace batteries **"BAT"**-battery low, approximately 50 tests can still be done Temperature of sensor cartridge/analyzer is out of range **"Cartridge Preburst"**-calibration fluid on sensors before it should be **"Invalid or Expired CLEW"**-Standardization set expired, missing or corrupted…need to download CLEW **"SIM"**-use electronic simulator, must be done every 8 hrs

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2. Remove cartridge from pouch. Handle a cartridge by its edges. Avoid touching the contact pads or exerting pressure over the center of the cartridge.

3. Direct needle, pipette tip or capillary tube into the sample well. Dispense sample until it reaches the fill mark on cartridge.

4. Fold the snap cover over the sample well until it reaches the fill mark on the cartridge.

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5. Push the cartridge into the cartridge port on the bottom of the analyzer.

6. Never attempt to remove a cartridge while the **LCK** message is displayed.

7. Enter operator ID number up to 7 digits. *(Repeat operator ID number for verification.*)

8. Enter patient ID number up to 12 digits. (*Repeat patient ID number for verification.*)

9. Enter blood gas parameters and sample type when applicable.

10. View results on the analyzer's display.

11. Remove the cartridge after the **LCK** message disappears. The analyzer is ready for a new cartridge immediately.

12. Screen display deactivates after 45 seconds to preserve battery life. Results can be redisplayed by pressing the Display key.

Reviewing Test Results

1. Test results are displayed numerically, and with bargraphs. Tick marks indicate reference ranges. (*Blood gas parameters and their associated calculated values are **not** displayed with reference ranges.*)

2. Results that are unreportable due to sensor errors are flagged with "***".

3. Results outside the reportable range are flagged with "<" or ">".

Printing Test Results

1. Place the analyzer in the IR Link cradle. Turn the printer on. The green printer light should be lit.

2. To print the displayed test record, press the **PRT** key.

3. To print a stored test record(s), select "Print Results" from the Stored Results menu. Select records to be printed by pressing key(s) corresponding to numbers beside record(s*). (Deselect a record by pressing the number again.*) Press the **PRT** key to print record(s).

4. To cancel printing, press the * key.

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6. Never attempt to remove a cartridge while the **LCK** message is displayed.

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4. To cancel printing, press the * key.

i-STAT Test Results

TEST	UNITS	REPORTABLE RANGE	REFERENCE RANGE	
			Arterial	**Venous**
Na	mmol/L	100-180	138-146	138-146
K	mmol/L	2.0-9.0	3.5-4.9	3.5-4.9
Cl	mmol/L	65-140	98-109	98-109
pH		6.5-8.0	7.35-7.45	7.31-7.41
pCO_2	mmHg	5-130	35-45	41-51
pO_2	mmHg	5-800	80-105	
iCa	mmol/L	0.25-2.50	1.12-1.32	1.12-1.32
BUN	mg/dL	3-140	8-26	8-26
Urea	mmol/L	1-50	2.9-9.4	2.9-9.4
Glu	mg/dL	20-450	70-105	70-105
Glu	mmol/L	1.1-25.0	3.9-5.8	3.9-5.8
Hct	% PCV	10-75	38-51	38-51
Hb*	g/dL	3-26	12-17	12-17
TCO_2*	mmol/L	1-85	23-27	24-29
HCO_3*	mmol/L	1-85	22-26	23-28
BE_{ecf}*	mmol/L	(-30)-(+30)	(-2)-(+3)	(-2)-+3)
Anion Gap	mmol/L	(-10)-(+99)	10-20	10-20
sO_2*	%	N/A	95-98	95-98

*calculated values

Cartridge Information

1. Cartridges should remain in pouches until time of use.
2. Store cartridges at 2 to 8 ^{o}C. Do not use after expiration date.
3. Allow cartridges to equilibrate and come to room temperature before opening pouches. Cartridges requiring thermal control should stand at room temperature for 4 hours before use. Cartridges not requiring thermal control may be used after standing 5 minutes at room temperature---an entire box should stand at room temperature for 1 hour.
4. Cartridges may be stored at room temperature for 14 days. Do not return cartridges to the refrigerator once they have been at room temperature. Mark the calendar on box with room temperature expiration date.

Verifying Cartridge Integrity

1. Verify the integrity of a new shipment of cartridges, on receipt, by analyzing 2 levels of fluids (i-STAT Controls or Calibration Verification Set) using any verified i-STAT analyzer and a representative sample of the lot(s) of cartridges received. Use the expected values published in the fluids' package insert to verify the integrity of the cartridges.
2. A procedure should be in place to control and monitor proper storage. Cartridges maintained according to i-STAT storage requirements will retain their performance at least until the expiration date.

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TEST	UNITS	REPORTABLE RANGE	REFERENCE RANGE	
			Arterial	**Venous**
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pH		6.5-8.0	7.35-7.45	7.31-7.41
pCO_2	mmHg	5-130	35-45	41-51
pO_2	mmHg	5-800	80-105	
iCa	mmol/L	0.25-2.50	1.12-1.32	1.12-1.32
BUN	mg/dL	3-140	8-26	8-26
Urea	mmol/L	1-50	2.9-9.4	2.9-9.4
Glu	mg/dL	20-450	70-105	70-105
Glu	mmol/L	1.1-25.0	3.9-5.8	3.9-5.8
Hct	% PCV	10-75	38-51	38-51
Hb*	g/dL	3-26	12-17	12-17
TCO_2*	mmol/L	1-85	23-27	24-29
HCO_3*	mmol/L	1-85	22-26	23-28
BE_{ecf}*	mmol/L	(-30)-(+30)	(-2)-(+3)	(-2)-+3)
Anion Gap	mmol/L	(-10)-(+99)	10-20	10-20
sO_2*	%	N/A	95-98	95-98

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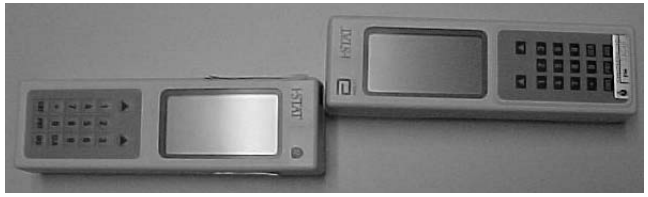
Updating iStat Software - Analyzer to Analyzer

The following is the process for downloading iStat software from one handheld unit to another.

1. Run the external Electronic Simulator on the "sending unit".
2. Download or print all stored data.

Note: All stored data will be lost after the software is updated.

3. With the Simulator test results showing on the display of the "sending unit", Press and hold the DIS key and press the soft key for the Menu.
4. Select 3 – Send Software. The analyzer screen should say "Waiting to send"
5. Set both analyzers on a flat surface and place the Infrared LED windows are directly facing each other.



6. On the "receiving analyzer", make sure the display is off. Press and hold the *key then press DIS
7. The display of the "sending unit" will change from waiting to sending, and a countdown will be displayed.
8. Release the * key and DIS
9.

Do not move the analyzers while the software is being transferred

10. The display of the "sending unit" will change back to the Electronic Simulator results when this process is finished.
11. Run the external Electronic Simulator on the analyzer with the new software.

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FIELD STERILIZER

The sterilizer is of fully jacketed, horizontal pressure type construction, and is designed as a portable unit for use under field emergency conditions. It is suitable for the sterilizing and drying of surgical instruments, utensils, dressings, and flasked surgical solutions.

Water is retained in the jacket of the sterilizer, and when it is heated, the hot gases are directed around the shell and out vent pipes at the top of the unit. A low water cut-off is provided for protection of the electric heating elements.

The sterilizer is equipped with a single control multiport valve and vacuum drying system. With this arrangement, a single control valve directs the team flow and exhaust by means of successive positions of the control knob. Provision is made for fast or slow exhaust and vacuum drying.

OPERATING INSTRUCTIONS

FILLING WITH WATER

If the sterilizer is operated on electric power or gasoline heat, the jacket must be filled with water as pure as possible. Check the jacket at every cycle. A new cycle should not be started if the jacket is less than half full. If the sterilizer is allowed to run dry, the low water cut-off will trip out, thus interrupting the cycle.

If distilled water is used, it results in less frequent cleaning of the jacket interior.

CAUTION

Lift the “relieve handle” of the safety valve or turn operating valve to “dry” position to release any pressure in the jacket before removing the plug from the filling funnel.

1) Remove the plug from the filling funnel
2) Turn the operating valve to the “sterilize” position
3) Fill the jacket with water through the funnel until the sight glass shows “full”
4) Turn the operating valve “off”
5) Replace the plug in the funnel

PRELIMINARY PROCEDURE

CAUTION

Ensure that the frame of the sterilizer is adequately grounded before operating on electric power.

1) Ensure that the sight glass shows the water level in the jacket to be at least at the half mark
2) Turn the “pressure control switch” know to the maximum clockwise position
3) Ensure that the operating valve is in “off” position\
4) Turn the heat switch on. The heaters are energized and the red pilot light will glow.
5) When the jacket pressure gauge shows the desired pressure (for 250ºF operation: 18 psig, and for 270ºF operation: 29 psig), turn the “pressure control switch” know slowly

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counterclockwise until the pilot light goes out. The “pressure control” will then cycle automatically, maintaining the selected pressure. A preheating time of 10 to 15 minutes is recommended to allow the pressure to stabilize.

NOTE

There are no markings or calibration on the pressure control switch since temperature is a function of the absolute pressure rather than gauge pressure. Depending on altitude and atmospheric conditions, to obtain 250ºF temperature may require anywhere between 15 and 20 psi gauge pressure and to obtain 270ºF temperature may require between 27 and 32 psi gauge pressure. Therefore, the pressure switch must be adjusted to the pressure, which will give the desired temperature, and the setting will vary according to atmospheric conditions and altitude.

6) The sterilizer is now ready for loading.

NOTE

In the event that water in the jacket runs low, the low water cut-off will interrupt the power supply to heaters. If this occurs lift the “relieve handle” on the safety valve to release any pressure in the jacket before removing the plug from the filling funnel. Wait until internal parts cool blow the boiling point and refill the jacket with water. Then press the reset button (located underneath the heater box). Then proceed with the regular operating cycle from the beginning.

OPERATION

1) Load the sterilizer leaving enough space between the packs to permit free circulation of steam. Too close packing of fabric loads will slow the cycle and may cause failure in sterilization.
2) Close the door and tighten hand wheel securely. The hand wheel will not operate until the door locking arms are properly located in the end rings. This is accomplished by rotating the “quick-throw” handle clockwise.
3) Turn the operating valve to the “sterilize” position
4) The jacket pressure will fall as the chamber fills with steam and both jacket and chamber will then build up to the desired pressure. When the thermometer in the chamber drain line reads the desired temperature, the timing of the exposure period may commence.
5) At the end of the exposure period, turn the operating valve to “Fast Exhaust” for fabric or instrument loads. “Slow Exhaust” for solution loads.

CAUTION

Leave the machine alone until the chamber pressure gauge shows zero pressure.

NOTE

Source of heat should be turned off when operating valve is turned to the “Slow Exhaust” position. Heat should remain on for “Fast Exhaust” or “Dry” cycle.

6) If drying cycle is required (as in fabric loads), turn the operating valve to “dry”
7) Turn the operating valve to “off”. Loosen the door locking arms and allow the load to cool for five minutes. Open the door and remove the load.

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The sterilizer may be reloaded and recycled immediately. If sterilizer is not to be used again immediately, turn off the heat source and turn the operating valve handle to the "Dry" position. This will bleed of pressure and vent the jacket to prevent a vacuum from forming. The sterilizer door should be closed, but not tightened to prevent vacuum forming in the chamber.

RECOMMENDED EXPOSURE PERIODS

FABRIC LOADS

30 Minutes at 250ºF
Dry for 15 Minutes

SOLUTION LOADS

1000 ml Flasks:
30 Minutes at 250ºF
Slow Exhaust to Zero Pressure
Crack door for 5 Minutes

EMERGENCY

Small Instrument Load:
3 Minutes at 270ºF
Fast Exhaust

When sterilizing solutions, use only thermal shock-resistant containers (Pyrex, Vicor, etc.) with self-venting closures. Do not leave door open or remove glass containers until the chamber drain thermometer indicates 200ºF or lower.

PREVENTIVE MAINTENANCE

Preventive maintenance instruction is order to prevent possible collapse of the sterilizer chamber.

A) If available use only distilled water. If this is not possible, use water as pure as possible, demineralized and/or filtered, as required, to assure that it is free of mud, sediment, and minerals.
B) Use care in filling the sterilizer jacket, to prevent overflow of water. When filling, vent air from the jacket by manually actuating the safety valve or by turning the selector valve know temporarily to the "Sterilize" position, with the chamber door open. Entrance of water into the low water cut-off switch enclosure, at the rear of the sterilizer, can disable this essential protective device. Under no circumstances should the sterilizer be hosed down for cleaning.
C) Daily, check the low-water cut-off and water gauge (sight glass) for proper functioning; by opening the drain valve and draining the jacket while the heating elements are turned on (indicated by glow of the red pilot light). Caution: The drain valve should be piped to a container, to prevent operator injury from love steam. The low water cut-off should actuate, to turn off the power, by the time the jacket is drained. The water gauge should now read empty.
D) Daily, check the pressure control switch in accordance with steps 1 – 5 of the Preliminary Procedure section.

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D) Daily, check the pressure control switch in accordance with steps 1 – 5 of the Preliminary Procedure section.

E) Daily, manually actuate the “relieve handle” of each safety valve, with steam pressure in the jacket to assure that these valves are operable.

Utilizing the preventive maintenance procedure, the operator can readily determine the serviceability of the sterilizer. If the low water cut-off fails to actuate or the water gauge remains full, when checked as described above, the operator should, if practical, discontinue use of the unit until a medical equipment repairman is available to restore it to serviceability. Under emergency conditions, an unserviceable unit may be utilized, provided the operator ensures it contains sufficient water in the jacket at all times.

PREPARATION FOR SHIPMENT OR STORAGE

1) The interior surface of the shell should be cleaned thoroughly by washing with a mild detergent – **do not use an abrasive cleanser**. All shelving and all exposed interior surfaces of the case should be cleaned in the same manner. The chamber drain plug should be cleaned and all lint and sediment removed from the strainer.
2) With the sterilizer door open, turn the operating valve to the “sterilize” position and open the jacket drain valve. Gently rock the sterilizer from side to side and from end to end to ensure removal of all water from the jacket, chamber, and piping.
3) Turn the operating valve to the “dry” position and leave all valves open.
4) The sterilizer door should be closed and tightened only enough for the handles to clear the front door of the case when it is closed. Remove all external piping and wiring.
5) Unscrew the two “T” bars holding the rear door to the case. Raise back of unit up to permit swinging the door up to the closed position and latch door into place. Release “T” bars on front door, swing up into closed position and latch into place.

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Belmont Fluid Management System 2000

The **Belmont Fluid Management System (FMS 2000)** combines advanced microprocessor technology with an efficient mechanical system to provide a simple and safe system for rapid infusion of warmed fluid. The FMS 2000 infuses blood, replacement IV fluids or irrigation fluids warmed to physiologic temperature at user-set rates from 10 to 500 milliliters per minute (ml/min). Low infusion rates of 2.5 and 5.0 ml/min (150 and 300 ml/hr) are also available to keep the venous line open. No heating is provided at these low infusion rates. The system is capable of heating fluids from 4°C to 37.5°at 500 ml/min.

The system monitors temperature, line pressure, and air in the fluid path to ensure safe operation and alarms at all unsafe conditions. A hardware override circuit prevents unsafe operation in case of system computer failure. A touch screen displays flow rate, total fluid used, temperature, line pressure, alarm and status messages and proper procedures to proceed safely after an alarm situation.

A battery backup allows for mobile transport of the patient and system. During battery operation, fluid warming is disabled while pump operation and safety monitoring remain active.

Indications for Use & Contraindications

The FMS 2000 is for use in high blood loss surgical procedures, trauma and any situation where rapid replacement of warmed blood or replacement fluid at 10 – 500 ml/min is required. It can also be used to deliver irrigation fluids at rates up to 500 ml/min.

The system should not be used where the desired flow rate is below 150 ml/hr or above 500 ml/min. The system should not be used to warm platelets, cryoprecipitates or granulocyte suspensions. This system is not intended for drug administration.

FMS 2000 should not be used where rapid infusion is medically contraindicated.

Installation of Disposable Set

1. Remove the disposable set from the tray and lay the reservoir chamber over the top of the machine. With the red tinted tubing on top, insert the heat exchanger into the well.
2. Push the interlock block into the slot above the pump and firmly position the tubing into the fluid out detector.
3. Guide the curved piece of pump tubing over the pump head and position the pump tubing into the groove. Check that the thinner recirculate line is in the groove to the right.
4. Place pressure chamber into the pressure chamber slot. Firmly insert the wider infuse line into the air detector and to the left of the valve wand.
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Priming the Disposable Set

The system is primed in two steps using crystalloid fluid:

1. **Prime the Main System** – The main system including reservoir chamber, pressure chamber, heat exchanger, and internal tubing is primed automatically for 100 ml at 500 ml/min to remove the air and replace it with fluid.
2. **Prime the Patient Line** – The patient line prime is done under user control to remove all air from the patient line.

Priming the Main System

1. Prime the system with crystalloid that is under 42°C. Infusing fluids 42°C and over will trigger the Over Temperature Alarm. DO NOT PRIME WITH BLOOD.
2. Close both bag clamps. Remove the bag spike cap(s) and insert bag spike(s) into the fluid bag(s), pierce it fully to ensure that fluid flows freely. Unclamp the bag clamp(s).
3. When hanging the fluid bag above the machine, the pump tubing that is seated in the fluid out detector should not be stretched. Stretching the pump tubing may cause false Fluid Out alarms.
4. The recirculate line must not be kinked or restricted.
5. For optimal system performance, packed red cells should be of good quality.
6. The course blood filter inside the reservoir chamber should be replaced every 4 hours or less when blood products are used. Material accumulated on the surface of the filter can promote bacterial growth and clog flow. Replace the reservoir chamber or disposable set every 4 hours or when the flow rate is affected. The Fluid Out alarm will occur when the flow through the filter is restricted.
7. Press the PRIME key to initiate prime. The infuse line is closed off by the diversion valve and fluid is sent through the disposable at 500 ml/min. The prime volume countdown is displayed on the screen. One hundred milliliters of fluid is needed to prime the system.
8. If air is detected during Prime, the volume countdown will be reset to 100 ml again. Air in the disposable set is recirculated back to the reservoir chamber and vented out the hydrophobic filter located on top of the reservoir chamber or back into the fluid bag if both bag spikes have pierced the fluid bag(s) and both bag clamps are opened. Heating occurs during Prime. The prime sequence will automatically stop when countdown reached 0 ml. If after 30 seconds the countdown does not decrease to at least 87 ml, the system will stop and prompt the user with the Prime screen to unclamp the lines and restart the Prime.
9. If Prime has to be stopped, press STOP. This does not bypass the full prime. The prime volume countdown will remain on the screen. To continue Prime, press RESUME PRIME. When the process is complete, no air should remain in the main system fluid circuit.

Priming the Patient Line

1. The patient line must be primed before infusion. The user controls both the speed and duration of the Patient Line Prime. This step primes the patient line with warm fluid.
2. Press PT LINE PRIME once to prime at 50 ml/min or press and hold the key to prime at 200 ml/min.
3. Press STOP or engage the roller clamp first and then press STOP to stop the flow when the patient line is fully primed. Inspect the patient line for air bubbles.

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Fluid Infusion

The infuse rate automatically starts at 10 ml/min when the main operating screen first appears. Adjust the flow rate by pressing INFUSE RATE▲ or INFUSE RATE▼. Press MAX RATE to immediately set the infuse rate to the maximum rate of 500 ml/min or the maximum rate allowable under pressure control.

Automatic Warming

The system automatically warms the fluid to physiological temperature at all flow rates in the ml/min range.

1. For flow rates above 50 ml/min, the fluid will warm to 37.5°C.
2. For flow rates from 10 ml/min to 50 ml/min, the fluid will be warmed to 39°C to help compensate for thermal losses in the patient line under low flow conditions.
3. There is no heating at 2.5 and 5.0 ml/min (150 and 300 ml/hr) settings. Message "LOW FLOW, NO HEATING" flashing on the screen indicates that the system is not heating at low flow rates.

Pressure Control

Pressure control regulates the pump speed to keep line pressure under the user-set pressure limit. The pressure status line flashes and a periodic beep sounds while the system is under pressure control. Line pressure is mainly due to the small orifice of the infusion set or any occlusions in the line. The pressure limit is set at the factory to the maximum limit of 300 mmHg,

A larger bore catheter results in lower line pressure and lower line pressure allows higher flow rates.

Automatic Air Purging

After every 500 ml of fluid is infused, the diversion valve will momentarily switch into the recirculate position for a short duration to automatically remove air from the main system circuit into the reservoir chamber. Air in the reservoir chamber may be vented out the hydrophobic filter or back into the fluid bag if both clamps are attached to fluid bags and opened. The RATE status line displays AIR REMOVAL during this process. The volume readout (VOL) remains unchanged during automatic air purging and resumes counting with infusion resumes. This process is automatic and requires no operator action.

The recirculate rate is temporarily set to 500 ml/min during automatic air purging. When infusion resumes, the system returns to the previously set rate.

Bolus Infusion

Press BOLUS to deliver the fixed volume indicated on the key at a rate of 200 ml/min. To change the flow rate during the bolus infusion, press the RATE▲ or RATE▼ keys or MAX RATE. At the end of the bolus volume, the system returns to the previously selected flow rate if the previous rate was 50 ml/min or lower. If the previous rate was higher than 50 ml/min, the flow rate will be set to 50 ml/min.

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Recirculation Mode

The RECIRC key sets the system into the Recirculation Mode. The diversion valve shuts off the infusion line to the patient and recirculates the fluid through the system at a preset rate of 200 ml/min. The infusate in the reservoir chamber and the main system will be warmed and air in the line swept into the reservoir chamber. The system will automatically return to the Stop Mode after 5 minutes of recirculation if the operator does not terminate recirculation.

WARNING

Excessive or prolonged recirculation may damage red blood cells by exposing them repeatedly to the rollers inside the pump head. Limit the time the blood is allowed to recirculated.

Battery Operation

The system can operate in battery mode during transport. The built-in rechargeable battery automatically charges whenever the system is connected to line power. The system automatically switched to battery operation when the AC line is disconnected. Battery operation should be used only briefly or at very low flow rates because there is no heating. The maximum flow rate is 50 ml/min. Full safety monitoring remains active. The normal running time in battery operation is at least 30 minutes.

When the battery runs low, the system will display BATT LOW message and sound an audible alarm. The system should be plugged into an AC outlet to continue operation and charge the battery. The normal recharge time is 8 hours.

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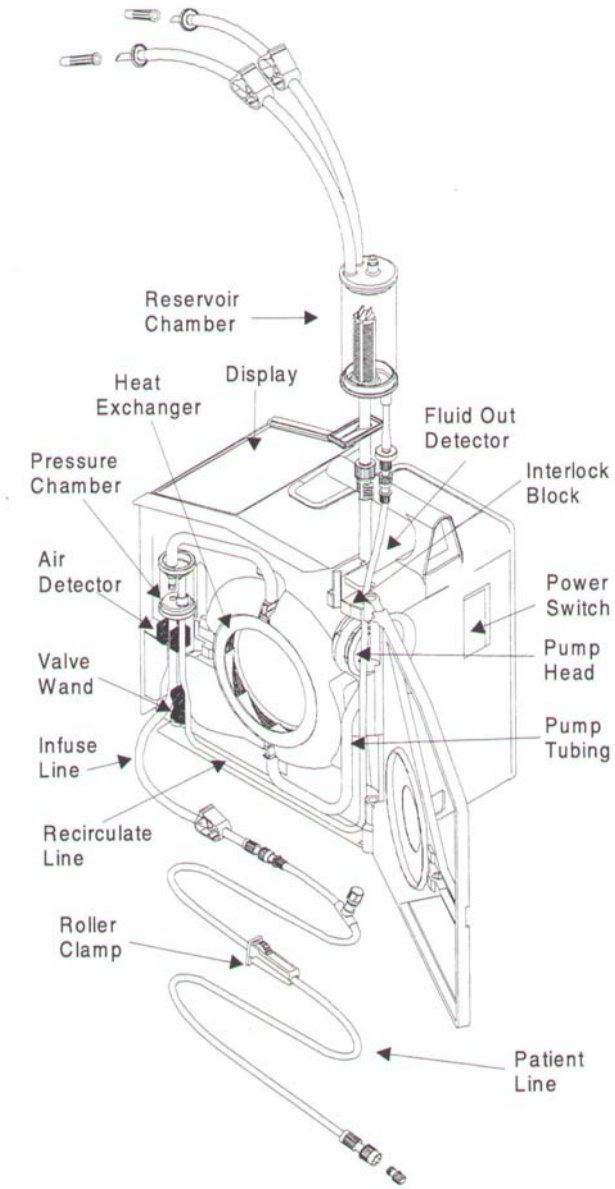
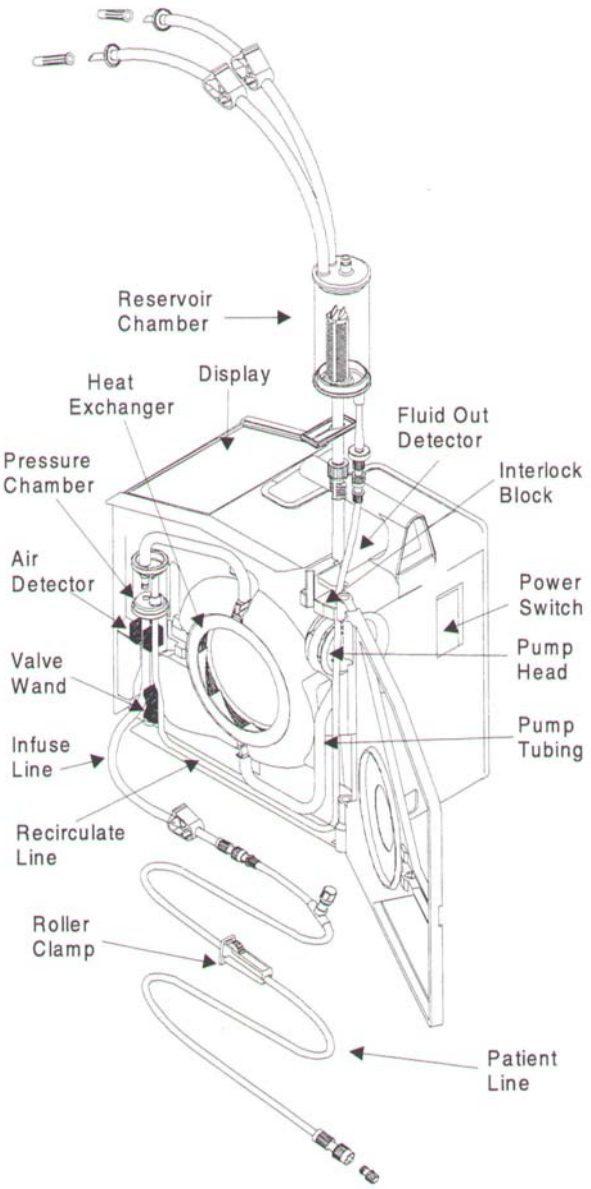


System Diagram Showing Main Components



System Diagram Showing Main Components

Troubleshooting Alarm Messages

Alarm Message	Possible Condition	Detection Criteria	System Response	Operator Action
HIGH PRESSURE	Patient line is blocked Recirculate line is blocked Infusion site is not well placed The catheter bore size is too small	Line pressure increase greater than 40 mm Hg/ml Pressure >400 mm Hg Under pressure control, the flow rate is reduced to 0 ml/min	Stop pumping and heating. Sound alarm and display message. Valve in the recirculate position	Make certain that the flow path is not blocked Check that the recirculate line is not obstructed. Check that the infusion site is well placed and use the appropriate infusion set recommended. Press NEXT to silence the alarm and resume
AIR DETECTION	Air in the line. Tubing in the air detection sensor is not seated firmly in the detector Leak in the disposable	Air bubble is detected in the air detection sensor	Stop pumping and heating. Sound alarm and display message. Valve in the recirculate position	Open the door to silence the alarm Check for air bubbles and possible leaks Squeeze the tubing directly below air detector to clear any trapped air out of the sensor. There should be no trapped air remaining within the air detector Check the air detector and make certain that it is clean and nothing is obstructing the sensor Reseat the tubing in the air detector and make certain that it is seated firmly in the sensor Press REPRIME to reprime main system fluid circuit Check for air in the disposable set and patient line before

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Troubleshooting Alarm Messages

Alarm Message	Possible Condition	Detection Criteria	System Response	Operator Action
HIGH PRESSURE	Patient line is blocked Recirculate line is blocked Infusion site is not well placed The catheter bore size is too small	Line pressure increase greater than 40 mm Hg/ml Pressure >400 mm Hg Under pressure control, the flow rate is reduced to 0 ml/min	Stop pumping and heating. Sound alarm and display message. Valve in the recirculate position	Make certain that the flow path is not blocked Check that the recirculate line is not obstructed. Check that the infusion site is well placed and use the appropriate infusion set recommended. Press NEXT to silence the alarm and resume
AIR DETECTION	Air in the line. Tubing in the air detection sensor is not seated firmly in the detector Leak in the disposable	Air bubble is detected in the air detection sensor	Stop pumping and heating. Sound alarm and display message. Valve in the recirculate position	Open the door to silence the alarm Check for air bubbles and possible leaks Squeeze the tubing directly below air detector to clear any trapped air out of the sensor. There should be no trapped air remaining within the air detector Check the air detector and make certain that it is clean and nothing is obstructing the sensor Reseat the tubing in the air detector and make certain that it is seated firmly in the sensor Press REPRIME to reprime main system fluid circuit Check for air in the disposable set and patient line before

				infusing
FLUID OUT (Air detected in top sensor)	Out of infusate Bag clamps not fully opened Bag not fully spiked Tubing in the fluid out sensor is not seated firmly in the detector Tubing in the fluid out sensor is stretched Clogged air vent Clogged coarse blood filter	Air bubble was sensed continuously in 1 ml of fluid pumped Tubing pulls away from the sensor	Stop pumping and heating. Sound alarm and display message. Valve in the recirculate position	Press MUTE to silence the alarm If out of fluid, add additional fluid and press REPRIME If the reprime volume count does not count down from 100 to 0 ml: then - Check the bags are fully spiked and clamps are fully opened - Check that the pump head tubing is not stretched and is seated firmly within the fluid out sensor - Check the fluid out sensor and make certain it is clean and there is nothing obstructing contact with the sensor If the reservoir chamber stays empty during reprime, the air vent filter may be clogged. It this case, pierce the fluid bag(s) with both bags spikes and fully open both clamps to allow the air in the reservoir chamber to escape into fluid bag(s) and the fluid to fill the reservoir chamber High amounts of particulates in the blood will clog the course blood filter in the reservoir chamber. Replace reservoir chamber or disposable

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115 HEATING FAULT	Wet, dirty or blocked disposable set windows Wet dirty or blocked IR probe windows IR probe failure Heater Fault	The difference between actual and calculated temperature is more than 3C for more than 20 ml	Stop pumping and heating. Sound alarm and display message. Valve in the recirculate position	Check disposable set and flow path for occlusions. Make certain the windows on the disposable set and the IR probes are clean and dry and free from contaminates. Clean window with soft cloth and alcohol if necessary. Dry off windows before continuing. Press RETRY to continue Turn off power and service machine if error persists
OVER TEMP	Fluid supply is over the temperature limit Fluid heated to over the temperature limit	Temperature ≥ 42°C	Stop pumping and heating. Sound alarm and display message. Valve in the recirculate position	Fluid supply over the temperature limit cannot be used for infusion. Use lower temperature fluid supply Clamp off the bag spikes and patient line and remove disposable. Turn off power and restart system with a new disposable. Service machine if problem persists **WARNING** **Do not infuse blood that is in the disposable set when overtemp condition occurs. Red cells subjected to high temperature may not be safe to infuse.**

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APPENDIX II

Useful Abbreviations and Acronyms
AE Classifications
AE Contact Numbers

APPENDIX II

Useful Abbreviations and Acronyms
AE Classifications
AE Contact Numbers

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Useful Abbreviations and Acronyms

AC	Alternating Current
ACC	Air Combat Command
ADCOM	Administrative Control
ADVON	Advanced Echelon
AE	Aeromedical Evacuation
AECC	Aeromedical Evacuation Coordination Center
AECE	Aeromedical Evacuation Control Element
AECM	Aeromedical Evacuation Crew Member
AECMC	Aeromedical Evacuation Crew Management Cell
AECOT	Aeromedical Evacuation Contingency Operations Training
AEFS	Aeromedical Evacuation Flight Surgeon
AELT	Aeromedical Evacuation Liaison Team
AEMS	Aeromedical Evacuation Mission Support
AEOO	Aeromedical Evacuation Operations Officer
AEOT	Aeromedical Evacuation Operations Team
AES	Aeromedical Evacuation Squadron
AESC	Aeromedical Evacuation Support Cell
AETC	Air Education and Training Command
AEU	Aeromedical Evacuation Unit
AFDIR	Air Force Directory
AFH	Air Force Handbook
AFI	Air Force Instruction
AFPAM	Air Force Pamphlet
AFRES	Air Force Reserve
AFSOC	Air Force Special Operations Command
AFTO	Air Force Technical Order
AGE	Aerospace Ground Equipment
ALCC	Airlift Coordination Cell
ALSS	Airborne Life Support System
AMC	Air Mobility Command
ANG	Air National Guard
AOR	Area of Responsibility
APES	Automated Patient Evacuation System
APOD	Aerial Port of Debarkation
APOE	Aerial Port of Embarkation
APT	Air Passenger Terminal
APU	Auxiliary Power Unit
ARC	Air Reserve Component
ARM	Aeromedical Readiness Missions
ASMRO	Armed Services Medical Regulating Office
ASTS	Aeromedical Staging Squadron
ATA	Actual Time of Arrival
ATC	Air Transportable Clinic
ATH	Air Transportable Hospital

Useful Abbreviations and Acronyms

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ACC	Air Combat Command
ADCOM	Administrative Control
ADVON	Advanced Echelon
AE	Aeromedical Evacuation
AECC	Aeromedical Evacuation Coordination Center
AECE	Aeromedical Evacuation Control Element
AECM	Aeromedical Evacuation Crew Member
AECMC	Aeromedical Evacuation Crew Management Cell
AECOT	Aeromedical Evacuation Contingency Operations Training
AEFS	Aeromedical Evacuation Flight Surgeon
AELT	Aeromedical Evacuation Liaison Team
AEMS	Aeromedical Evacuation Mission Support
AEOO	Aeromedical Evacuation Operations Officer
AEOT	Aeromedical Evacuation Operations Team
AES	Aeromedical Evacuation Squadron
AESC	Aeromedical Evacuation Support Cell
AETC	Air Education and Training Command
AEU	Aeromedical Evacuation Unit
AFDIR	Air Force Directory
AFH	Air Force Handbook
AFI	Air Force Instruction
AFPAM	Air Force Pamphlet
AFRES	Air Force Reserve
AFSOC	Air Force Special Operations Command
AFTO	Air Force Technical Order
AGE	Aerospace Ground Equipment
ALCC	Airlift Coordination Cell
ALSS	Airborne Life Support System
AMC	Air Mobility Command
ANG	Air National Guard
AOR	Area of Responsibility
APES	Automated Patient Evacuation System
APOD	Aerial Port of Debarkation
APOE	Aerial Port of Embarkation
APT	Air Passenger Terminal
APU	Auxiliary Power Unit
ARC	Air Reserve Component
ARM	Aeromedical Readiness Missions
ASMRO	Armed Services Medical Regulating Office
ASTS	Aeromedical Staging Squadron
ATA	Actual Time of Arrival
ATC	Air Transportable Clinic
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ATSO	Ability to Survive and Operate
BOS	Base Operating Support
BSS	Battery Support System
C/P	Cargo/Passengers
CASF	Contingency Aeromedical Staging Facility
CAT	Crisis Action Team
cc	Cubic Centimeters
cc/B	Cubic Centimeters per Breath
CCATT	Critical Care Air Transport Team
CENTCOM	U.S. Central Command
CHOP	Change of Operational Control
CINC	Commander in Chief
cm	Centimeters
CMT	Charge Medical Technician
CO2	Carbon Dioxide
COCOM	Combatant Command
COMMZ	Communications Zone
CONOPS	Concept of Operations
CONUS	Continental United States
CPAP	Constant Positive Airway Pressure
CRAF	Civil Reserve Air Fleet
DC	Direct current
DEPMEDS	Deployable Medical System
DIRAEFOR	Director, Aeromedical Evacuation Forces
DIRMOBFOR	Director, Mobility Forces
DMRIS	Defense Medical Regulating Information System
DOC	Designated Operational Capability
E.O.A.	Esophageal Obturator Airway
ECAS	Electrical Cable Assembly Set
ECG	Electro Cardiogram
ECMO	Extracorporeal Membrane Oxygenation
ECP	Entry Control Point
EMEDS	Expeditionary Medical Support
EMIS	Emergency and Military Infusion System
ERO	Engines Running Onload/Offload
ETA	Estimated Time of Arrival
ETD	Estimated Time of Departure
EUCOM	European Command
FASF	Fixed Aeromedical Staging Facility
FOB	Forward Operating Base
FRAG	Fragmentation Order
FS	Flight Surgeon
FTU	Flight Training Unit
GAETT	Global Aeromedical Evacuation Training Team
gm	Gram
GMT	Greenwich Mean Time
GPMRC	Global Patient Movement Requirements Center
GT	Ground Training
Hg	Mercury

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EMIS	Emergency and Military Infusion System
ERO	Engines Running Onload/Offload
ETA	Estimated Time of Arrival
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EUCOM	European Command
FASF	Fixed Aeromedical Staging Facility
FOB	Forward Operating Base
FRAG	Fragmentation Order
FS	Flight Surgeon
FTU	Flight Training Unit
GAETT	Global Aeromedical Evacuation Training Team
gm	Gram
GMT	Greenwich Mean Time
GPMRC	Global Patient Movement Requirements Center
GT	Ground Training
Hg	Mercury

HLZ	Helicopter Landing Zone
Hz	Hertz
ID	Internal diameter
ITV	Intrasit Visibility
IV	Intravenous
JFACC	Joint Force Air Component Commander
JOPES	Joint Operation Planning and Execution System
JRTC	Joint Readiness Training Center
JULLS	Joint Universal Lessons Learned System
kg	Kilograms
KVO	Keep Vein Open
L/cc	Liters per Cubic Centimeter
lbs	Pounds
LCD	Liquid Crystal Display
LED	Light Emitting Diodes
LPM	Liters per Minute
MA	Medical Attendant
MAJCOM	Major Command
MASF	Mobile Aeromedical Staging Facility
MCC	Mission Clinical Coordinator
MCD	Medical Crew Director
MEFPAK	Manpower and Equipment Force Packaging System
MEGP	Mission Essential Ground Personnel
MERC	Medical Equipment Repair Center
MISCAP	Mission Capability
ml	Milliliters
ml/hr	Milliliter per Hour
mm	Millimeters
MOA	Memorandum of Agreement
MOOTW	Military Operations Other Than War
MOU	Memorandum of Understanding
MRC	Major Regional Contingency
MTF	Medical Treatment Facility
MTP	Medical Technology Products
NATO	North Atlantic Treaty Organization
NCA	National Command Authorities
NDMS	National Disaster Medical System
NEO	Noncombatant Evacuation Operations
NMA	Nonmedical Attendant
NSN	National stock number
NTS	Neonatal Transport System
OCONUS	Outside of Continental United States
OEHL	Occupational and Environmental Health Laboratory
OOTW	Operations Other Than War
OPLAN	Opeation Plan
OPORD	Operation Order
OPR	Office of Primary Responsibility
OWL	Overweight Patient Litter (OWL)
PACAF	Pacific Air Forces

HLZ	Helicopter Landing Zone
Hz	Hertz
ID	Internal diameter
ITV	Intrasit Visibility
IV	Intravenous
JFACC	Joint Force Air Component Commander
JOPES	Joint Operation Planning and Execution System
JRTC	Joint Readiness Training Center
JULLS	Joint Universal Lessons Learned System
kg	Kilograms
KVO	Keep Vein Open
L/cc	Liters per Cubic Centimeter
lbs	Pounds
LCD	Liquid Crystal Display
LED	Light Emitting Diodes
LPM	Liters per Minute
MA	Medical Attendant
MAJCOM	Major Command
MASF	Mobile Aeromedical Staging Facility
MCC	Mission Clinical Coordinator
MCD	Medical Crew Director
MEFPAK	Manpower and Equipment Force Packaging System
MEGP	Mission Essential Ground Personnel
MERC	Medical Equipment Repair Center
MISCAP	Mission Capability
ml	Milliliters
ml/hr	Milliliter per Hour
mm	Millimeters
MOA	Memorandum of Agreement
MOOTW	Military Operations Other Than War
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MRC	Major Regional Contingency
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NSN	National stock number
NTS	Neonatal Transport System
OCONUS	Outside of Continental United States
OEHL	Occupational and Environmental Health Laboratory
OOTW	Operations Other Than War
OPLAN	Opeation Plan
OPORD	Operation Order
OPR	Office of Primary Responsibility
OWL	Overweight Patient Litter (OWL)
PACAF	Pacific Air Forces

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PEEP	Positive End Expiratory Pressure
PERSCO	Personnel Support for Contingency Operations
PKO	Peacekeeping Operations
POC	Point of Contact
POD	Point of Debarkation
POE	Point of Embarkation
POL	Petroleum, Oils and Lubricants
psi	Pounds per square inch
PTLOX	Patient Therapeutic Liquid Oxygen
SF	Standard Form
SIMV	Synchronized Intermittent Mandatory Ventilation
SITREP	Situation Report
SME	Squadron Medical Element
SORTS	Status of Resources and Training System
SOUTHCOM	Southern Command
SWA	Southwest Asia
T.O.	Technical Order
TA	Table of Allowances
TA	Table of Allowances
TACC	Tanker Airlift Control Center
TAES	Theater Aeromedical Evacuation System
TALCE	Tanker Airlift Control Element
TDY	Temporary Duty
TMO	Traffic Management Office
TPFDD	Time-Phased Force and Deployment Data
TPMRC	Theater Patient Movement and Requirements Center
USAARL	US Army Aeromedical Research Laboratory
USACOM	United States Atlantic Command
USAF	United States Air Force
USAFE	United States Air Forces in Europe
USAFR	United States Air Force Reserve
USTRANSCOM	United States Transportation Command
UT	Universal Time
UTC	Unit Type Code
VAC	Volts Alternating Current
VDC	Volts Direct Current
WARMED PS	Wartime Medical Planning System
WRM	War Reserve Materiel
Z	Zulu Time

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PEEP	Positive End Expiratory Pressure
PERSCO	Personnel Support for Contingency Operations
PKO	Peacekeeping Operations
POC	Point of Contact
POD	Point of Debarkation
POE	Point of Embarkation
POL	Petroleum, Oils and Lubricants
psi	Pounds per square inch
PTLOX	Patient Therapeutic Liquid Oxygen
SF	Standard Form
SIMV	Synchronized Intermittent Mandatory Ventilation
SITREP	Situation Report
SME	Squadron Medical Element
SORTS	Status of Resources and Training System
SOUTHCOM	Southern Command
SWA	Southwest Asia
T.O.	Technical Order
TA	Table of Allowances
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TACC	Tanker Airlift Control Center
TAES	Theater Aeromedical Evacuation System
TALCE	Tanker Airlift Control Element
TDY	Temporary Duty
TMO	Traffic Management Office
TPFDD	Time-Phased Force and Deployment Data
TPMRC	Theater Patient Movement and Requirements Center
USAARL	US Army Aeromedical Research Laboratory
USACOM	United States Atlantic Command
USAF	United States Air Force
USAFE	United States Air Forces in Europe
USAFR	United States Air Force Reserve
USTRANSCOM	United States Transportation Command
UT	Universal Time
UTC	Unit Type Code
VAC	Volts Alternating Current
VDC	Volts Direct Current
WARMED PS	Wartime Medical Planning System
WRM	War Reserve Materiel
Z	Zulu Time

AEROMEDICAL EVACUATION (AE)

Theater Patient Movement Requirement Centers (TPMRC)

CONUS: Scott (312) 576-6241
USAFE: Ramstein (314) 480-8028
PACAF: Yokota (315) 576-6241

Information for TPMRC

Name of patient
Rank, SS#, Branch of Service
Classification (See next page)
Movement Precedence (See below)
Attendants (If applicable)

Movement Precedence

Urgent
Save life, limb, eyesight
Immediate movement

Priority
Prompt care not available locally
Movement within 24 hours

Routine
Movement normally within 72 hours
Normally scheduled missions

AE Loading Principles (Contingency)

Aircraft load order:
Ambulatory, Delayed, Immediate, Expectant

Vehicle Litter load order:
Expectant, Immediate, Delayed

AEROMEDICAL EVACUATION (AE)

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Aircraft load order:
Ambulatory, Delayed, Immediate, Expectant

Vehicle Litter load order:
Expectant, Immediate, Delayed

AE Patient Classifications (Reference AFI 41-301)

1 – Psychiatric
- **A:** Severe psychiatric litter patient; requires rest4raings, sedation and supervision at all times
- **B:** Intermediate severity litter patient; restraints available but not normally required; requires sedation
- **C:** Moderate severity ambulatory patient; cooperative, reliable

2 – Litter
- **A:** Immobile, non-psychiatric; cannot move about on their own
- **B:** Mobile, non-psychiatric; can move about on their own

3 – Ambulatory
- **A:** Non-psychiatric, non-substance abuse; going for treatment
- **B:** Recovered; returning to home station
- **C:** Drug or alcohol (substance) abuse; going for treatment

4 – Infant (under 3 years of age)
- **A:** Occupying a seat; going for treatment
- **B:** Occupying a seat; returning from treatment
- **C:** Requires an incubator, litter type
- **D:** Litter
- **E:** Outpatient, ambulatory

5 – Outpatient
- **A:** Ambulatory, non-psychiatric, non-substance abuse; going for treatment
- **B:** Ambulatory, drug or alcohol (substance) abuse going for treatment
- **C:** Psychiatric; going for treatment
- **D:** Litter for comfort; going for treatment
- **E:** Litter for comfort; returning
- **F:** Returning

6 – Attendant
- **A:** Medical
- **B:** Non-Medical

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APPENDIX III
SPEARR CONOPS

APPENDIX III
SPEARR CONOPS

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EXECUTIVE SUMMARY

I. GENERAL. The Air Force Medical Service's Expeditionary Medical Support and Air Force Theater Hospital system (EMEDS/AFTH) is a modular, highly capable medical system that represents the essential elements of deployed Air Force medical support. The extremely mobile and clinically flexible lead UTC force module of the EMEDS/AFTH system is named the Small Expeditionary Aeromedical Rapid Response (SPEARR) Team. The SPEARR Team may be useful in crises actions requiring lightweight, rapid response assets and in deliberate planning actions as an initial one pallet equivalent modular component during the early and late vulnerable phases of a deployment. The SPEARR Team also significantly increases the flexibility of all larger EMEDS/AFTH assemblages during sustained deployments, including AEFs, by providing a modular, rapid medical response to crises within a theater of operations.

II. MISSION DESCRIPTION AND SCOPE OF CARE. The SPEARR Team module provides a very rapid response, extremely mobile, and highly clinically capable medical asset to support a wide spectrum of Expeditionary Aerospace Force contingency missions. The mission of the SPEARR Team is to enhance Global Health by providing force health protection for up to 500 contingency/disaster support personnel, or a 500 population at risk (PAR), for an initial period of five to seven days. Sustainment or resupply capability (10 day resupply consistent with other EMEDS modules) ensures continued medical care and force health protection, when required. The PAR may be comprised of all US military personnel or include a combination of international military and civilian personnel in a coalition operation. The scope of care includes public health/preventive medicine, flight medicine, primary care, emergency medicine, emergency surgery, perioperative care, critical care stabilization, patient preparation for aeromedical transport and aeromedical evacuation coordination/communication.

III. OPERATIONS. The SPEARR Team is capable of being ready for deployment within two hours of initial mission notification. This rapid response time is site specific and is the best case scenario for SPEARR Team response. The two-hour response time is dependent on the collocation of personnel and equipment and on a team standing "on call" or "Bravo" alert at all times. The team functions as an EMEDS UTC module which is comprised of 4 UTCs; the PAM ADVON Team (UTC FFGL2), the Mobile Field Surgical Team (UTC FFMFS), the Expeditionary Critical Care Team (UTC FFEP1) and the equipment only Expanded Capability and Infrastructure Module (UTC FFEE8). The team may deploy in a manportable mode (backpacks, medical bags, and personal equipment only) without the FFEE8 UTC or in a one pallet equivalent trailer mode which allows independent operations for five to seven days. Flexibility is essential in the programming, planning and deployment process to allow for the most efficient deployment of both the SPEARR Team and the EMEDS Basic (e.g. – larger AEF deployments). To achieve this flexibility and rapid response capability may require positioning of similar deployable assets at both Lead

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Wings and Medical Centers. These positioning factors must be accurately reflected in documents such the Medical Resource Letter in order to be applied with crisis action and deliberate planning tools.

IV. COMMAND AND CONTROL. Command and control of medical operations for the SPEARR Team in joint, coalition, or other operations will be defined in the warning, execution, and operation orders. The gaining unified command surgeon establishes theater medical policy, which is then promulgated through the AFFOR Surgeon down through the chain of command to the SPEARR Team mission leader. SPEARR Teams may fall under the TACON of the gaining unit, which the team(s) will support. When functioning as an independent medical unit, the SPEARR Team will operate under the direction of the installation/deployed commander or approved civilian equivalent. Most MAJCOMs will at most delegate TACON to deployed medical units, and only if a Joint Task Force has been activated. OPCON and ADCON would normally be retained at the JTF or component level. When augmenting an existing medical resource, the SPEARR Team will report directly to the senior ranking medical officer or in accordance with the command and control structure of larger medical elements such as an EMEDS/AFTH asset.

V. INTELLIGENCE, NATIONAL AGENCY, AND SPACE SUPPORT. Accurate medical intelligence is crucial to threat identification and application of appropriate preventative medicine measures. The host unit senior medical officer or other designated official US representative (in bare base scenarios) will coordinate communication of medical intelligence information.

VI. COMMUNICATIONS/COMPUTER SYSTEMS SUPPORT. The SPEARR Team utilizes communications and computer systems compatible with the Air Force Theater Medical Information Program. The team's deployed support includes one laptop computer, one digital camera, one INMARSAT, and Land Mobile Radios. Integrated systems applications such as the Global Expeditionary Medical System (GEMS) and patient care documentation with voice recognition software have been field tested with the SPEARR Team. The communication and computer systems requirements vary depending on the mode of deployment

VII. LINE INTEGRATION AND INTEROPERABILITY. Integration of deployed SPEARR Teams, as a four UTC module within the Air Force EMEDS/AFTH system of UTCs, is critical for successful medical operations. Integration needs to occur with the Line for expeditionary combat support (ECS), EMEDS/AFTH operations and aeromedical evacuation. The SPEARR Team's unique mobility and rapid response capabilities in disaster and other contingency scenarios also mandates effective integration and communication with Joint, Total Force, US national/government/international coalitions and non-government organizations (NGOs). ECS requirements include, but are not limited to water (potable water needed after 48 hours), fuel (one day fuel supply carried with SPEARR Team when authorized), transportation, logistics, and security. The team brings food for seven days (MREs). Rapid AE is essential to mission success.

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Wings and Medical Centers. These positioning factors must be accurately reflected in documents such the Medical Resource Letter in order to be applied with crisis action and deliberate planning tools.

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VIII. SECURITY. The Defense Forces Commander (DFC) or civilian counterpart shall be responsible for all security operations, physical security, and force protection issues. Current threat assessment and threat condition (THREATCON) will drive local security measures.
SPEARR Team personnel are responsible for following all personal protective measures as outlined in theater security briefings, force protection requirements, and OPORDS. All SPEARR Team members will attend security, antiterrorism, and weapons training as required. Defense Forces Commander and security forces will provide technical advice and recommendation to SPEARR Team personnel, as requested. SPEARR Team members may be issued weapons when authorized by the host unit commander. SPEARR Team personal protection includes physical security and also requires theater specific personal protective measures and personal protective equipment. The adequate force protection (including personal protection issues) of deployed UTC personnel is the responsibility of the local MTF and MAJCOM command structure. Funding and acquisition issues for deployed UTC personal protection are the responsibility of the same command structure.

IX. TRAINING. The SPEARR Team, as an integral module of the EMEDS/AFTH system, will be trained in accordance with the EMEDS training plan, the Air Force Medical Service Master Training Plan, and AFI 41-106 Medical Readiness Planning and Training. The intense clinical nature of the SPEARR Team's capabilities mandates that routine (i.e. daily) clinical skills sustainment be maintained. Additional AFSC and UTC specific training with respect to disaster medicine is recommended.

X. LOGISTICS. The four UTCs in the SPEARR Team module (three are personnel and equipment, one is equipment only) comprise all the equipment and supplies necessary to care for the population at risk for up to 5-7 days. Additional expansion/resupply packages may be utilized to cover the transition period to larger medical assets in a crisis or other deployment plan. The resupply packages will be for 10 day periods, consistent with the 10 day resupply or sustainment packages for other EMEDS increments or UTC modules (e.g. EMEDS Basic, EMEDS 10 and EMEDS 25 bed increments). Storage of full SPEARR Team assemblages at certain locations, including specific overseas locations, is essential to ensure a rapid response (ready for deployment within two hours) and EMEDS/AFTH integrity and planning factors require other SPEARR Teams to be stored at AEF Lead Wings.

XI. SUMMARY. The USAF SPEARR Team UTC force module represents a small (one pallet equivalent), extremely mobile and highly clinically capable medical asset that forms one of the lead elements for the EMEDS/AFTH system. The SPEARR Team's extremely lightweight, flexible mobility platforms, rapid response capability, and very broad scope of medical care ensure that a wide spectrum of global EAF contingencies will receive continuous health assessment and emergency medical support.

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SECTION 1 - GENERAL

1.1. Purpose: This document provides the Concept of Operations (CONOPS) for the Small Portable Expeditionary Aeromedical Rapid Response (SPEARR) Team. It describes the deployment, employment, and re-deployment of this team. The SPEARR Team may be deployed for medical support as either a freestanding medical unit in austere conditions or as the first increment or a four UTC module of the EMEDS system in the full spectrum of EAF contingency operations, including humanitarian and civil disaster response, small scale contingencies (SSCs), and major theater wars (MTW). The mobility and mission flexibility of each Air Force Medical Service (AFMS) EMEDS Basic increment is significantly enhanced with implementation of the SPEARR Team force package. This basic source document provides baseline information for SPEARR Team utilization, equipping, future validation, and possible modification. Additionally, the CONOPS may be used as a guide for validating future SPEARR Team requirements and revisions to appropriate planning and training concepts. It focuses on pertinent aspects, capabilities, and interoperability. It is not intended to provide minute detail of all aspects of operations. AETC provides oversight for the command responsible for the SPEARR Team concept, and ACC is the command responsible for the entire EMEDS/AFTH system. PACAF, USAFE, CENTAF, SOUTHAF, and Joint Forces Command (USJFCOM) are the primary users of the SPEARR Team. The AFMS provides UTCs to support theater requirements. Command relationships and appropriate force protection procedures will be defined in warning, execution, or deployment orders.

1.2. Background: The Air Force Medical Service (AFMS) pursued the development of a small, highly mobile, rapidly deployable, modular medical contingency team in response to recent changes in Joint and Air Force doctrine that emphasize a modular response to the full spectrum of Global Engagement scenarios. The ten-member SPEARR Team concept was first developed and utilized as a rapid response clinical contingency/disaster response to multiple terrorist events and natural and technological disasters during the 1990s. The SPEARR Team is comprised of the initial UTC modules or “building blocks” in the EMEDS/AFTH system and provides essential public health, preventive medicine, primary care, emergency medicine, emergency surgery, and critical care. The development of the ten-member SPEARR team is closely linked historically with its three component manpower and equipment UTCs; the Mobile Field Surgical Team (MFST or UTC FFMFS), the Preventive Aerospace Medicine ADVON Module (PAM ADVON or UTC FFGL2) and the Expeditionary Critical Care Team (ECCT or UTC FFEP1). The MFST was developed to provide rapid response forward emergency medical and surgical care in 1994 and has been effectively used operationally in such areas as Grenada, Panama, Kuwait, Ecuador, Sierra Leone, the Congo, India, Pakistan, the Balkans, and multiple continental United States (CONUS) locations. The MFST has been effectively combined over the past four years on a number of real world patient care missions with Critical Care Air Transport Teams (CCATTs) and a two-person command/communication module. This prototype combination of UTCs, or force package, was known as a Deployable Aeromedical Readiness Team (DART). The

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original concept for Air Force rapid response, clinically intensive, lightweight teams, such as the MFST and CCATT, was derived from USAFE's Flying Ambulance Surgical Trauma (FAST) Team. The FAST Team was developed in 1984 as a response to the 23 October 1983 Beirut Marine Barracks terrorist bombing disaster, for which there was no mobile, rapid response, clinically intensive casualty care module available. The PAM Team was developed in the 1990s as an early medical presence in a bed-down location; to reduce the incidence of disease and non-battle injuries (DNBI) by assuring appropriate public health and preventive medicine measures as well as primary care. The PAM Team's aerospace medicine expertise also enhances the link between "ground medical UTCs" and the Aeromedical Evacuation (AE) system. The PAM Team is comprised of three modules (FFGL2, FFGL3, and FFGL4), all of which are completely interoperable within the EMEDS/AFTH system. The SPEARR Team deploys with only the first PAM module (FFGL2). The third manpower UTC module in the SPEARR Team force package, the ECCT, was developed as part of the EMEDS/AFTH system in 1999 to provide perioperative and medical critical care support for the MFST and EMEDS Basic modules. The final UTC in the SPEARR Team force package is the SPEARR Team Expanded Capability and Infrastructure Module (ECIM or UTC FFEE8), which is an equipment only UTC. The ECIM was developed to ensure that the SPEARR Team is self-sustaining and completely interoperable as the first "pallet equivalent" (with trailer) of the 3 pallet EMEDS Basic package.

Flexibility is essential in the programming, planning and deployment process to allow for the most efficient deployment of both the SPEARR and the EMEDS Basic modules (e.g. – larger AEF deployments). To achieve this flexibility and rapid response capability may require positioning of similar deployable assets at both AEF Lead Wings and Medical Centers. These factors must be accurately reflected in documents such the Medical Resource Letter (MRL) in order to be applied to deliberate planning tools such as the Air Force Worldwide UTC Availability Tasking Summary (AFWUS) and the Type Unit Characteristic (TUCHA).

1.3. Threat: The Global Engagement directive in our National Security and National Military Strategies charges Expeditionary Aerospace Forces to be able to rapidly deploy to many different parts of the world. People, systems and facilities of supporting bases are essential to the launch, recovery, and sustainment of aerospace platforms, usually as part of an Aerospace Expeditionary Wing or Group(AEW or AEG). Medical services are crucial to force health protection (base medical defense) and survive to operate (STO) and the resumption of operations during a wide spectrum of EAF operations. The National Air Intelligence Center's "Threat Compendium, Worldwide Threat to Air Bases: 1993-2003," NAIC-2660f-265-93, 24 Sep 93; and the Air Base Systems, Threat Environment Description," NAIC-157-664-95, June 1995, are the baseline threat references for air base operations. Threats can be viewed from a perspective of type of injury as well as types of weapons and personnel or activity. A basic assumption utilized to develop this CONOPS is that the SPEARR Team will usually operate primarily in a low conventional/low nuclear, biological, or chemical (NBC) threat environment when operating independently. The SPEARR Team may operate in a heightened threat environment with the support of

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appropriate additional UTCs and force protection elements. In far forward locations, the security of the team and patients will be dependent upon the host unit. Major threats expected during small scale contingencies (SSCs) include terrorism and information warfare (IW). Deployed commanders must be able to protect their units against terrorism, IW and natural, man-made, and technological disasters. The expected threats during theater warfare are more diverse. They include IW and terrorism as well as air-to-surface munitions, surface-to-surface munitions, special operations forces (SOF), and NBC weapons.

1.3.1. Conventional and Exotic/Unconventional Weapons: These weapons carry the potential to inflict personal injury in the form of trauma of varying degree. Weapons in this category include precision guided munitions, anti-personnel/vehicle mines, rocket artillery, aerial bombs, cruise missiles, ballistic missiles, airborne carbon fibers, metal-embrittling liquids, high-power microwave, and directed energy weapons. Widespread collateral damage is expected with the use of these weapons. Many of these weapons are subject to use by saboteurs, terrorists, SOF, as well as ground forces. Effectiveness of casualty care is related to rapid delivery of care, competent use of equipment and supplies, techniques representative of the current standard of care; medical information access, and rapid aeromedical evacuation (AE).

1.3.2. Weapons of Mass Destruction (WMD): Although the SPEARR Team is not currently capable of operations in a contaminated environment, the team's rapid response and tremendous mission flexibility provide the potential for unique medical capabilities in many scenarios. The SPEARR Team currently provides extremely limited decontamination capability ("hasty" decontamination only), but provides significant treatment for patients suffering from nuclear, chemical, or biological weapons affects after the patients have been decontaminated. A SPEARR Team, with adequate personal protective equipment, can effectively provide emergency medical care in a "Warm Zone" and provide complete emergency medical and surgical care with medical units set up in the "Cold Zone" of a WMD event. Interoperability of the SPEARR Team with other medical resources is necessary for effective medical treatment in a WMD response scenario. Enhancement of the SPEARR Team's ability to survive and operate in a contaminated environment is a planned future program improvement.

SECTION 2 - MISSION DESCRIPTION AND SCOPE OF CARE

2.1. Mission Description: The mission of the SPEARR Team is to enhance Global Health by providing force health protection for up to 500 contingency/disaster support personnel or a 500 population at risk (PAR). This PAR may be comprised of all US military personnel or include a combination of international military and civilian personnel in a coalition operation. Title 10 restrictions will apply when the PAR includes a mixed, international population. The SPEARR Team provides mission support as a rapidly deployable, highly mobile, and versatile personnel/equipment package. The SPEARR Team can operate independently in austere conditions as a clinical contingency/disaster medical resource, or augment existing medical resources

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in deployed field settings and definitive care facilities for more prolonged periods. The team has very broad clinical capabilities, including primary care, flight medicine, emergency medicine, emergency surgery and critical care as well as public health and preventive medicine. The SPEARR Team can be deployed with only personally carried or man portable equipment, using a minimum of airlift at a critical time or with a one pallet equivalent trailer mode which includes the trailer, team clinical and personal shelters, and significant additional supplies for clinical and team personnel sustainment. The team's four UTCs comprise a sub-module of EMEDS-Basic, allowing rapid integration with the more robust capabilities of EMEDS-Basic or other larger EMEDS/AFTH system increments within 48 hours. The SPEARR Team has been specifically designed and tested for interoperability with other US and allied services and civilian responders. If deployed with its full allowance standard, including backpack equipment and the one pallet equivalent trailer mode of equipment and supplies, the SPEARR team is self-sufficient with respect to shelter, waste disposal and food for five to seven days. An initial potable water supply is included for team members for up to 48 hours, after which the team must use other sources, part of which may come from team carried water filters. The team brings its own power generators (and one day supply of fuel) within the one pallet configuration, but must rely on local contracts or the Expeditionary Medical Logistics system for fuel beyond its one day intrinsic supply. The SPEARR Team requires host unit support for security. For situations which anticipate heavy patient loads or requiring more than five to seven days of support, immediate consideration should be given to rapid augmentation with an EMEDS-Basic or larger EMEDS/AFTH assemblages. If a larger assemblage is deemed unnecessary, then reachback capability must be established early in the mission or deployment of resupply UTCs for the four SPEARR Team UTCs with the initial deployment should be considered (reference paragraph 10.8 on reachback medical logistics resupply and sustainment).

2.2. Scope of Care: Upon appropriate tasking, the SPEARR Team can be ready to deploy within two hours of initial mission notification. This rapid response time is site specific and is the best case scenario for SPEARR Team response. The two hour response time is dependent on the collocation of personnel and equipment and on a team standing on Bravo alert at all times. Transportation requirements (e.g. - ready cargo for airlift or ground trailer hitch within two hours) will establish the actual arrival time on-scene. Other SPEARR Teams may not be able to meet a two hour response time, but remain "rapid response" assets relative to an individual unit's manpower and equipment limitations. The SPEARR Team will arrive on location, assess existing medical needs and assets, and provide the following services: public health/preventive medicine, flight medicine, primary care, emergency medicine, emergency surgery, perioperative care, critical care stabilization, patient preparation for aeromedical transport and aeromedical evacuation coordination/communication. Initial contingency/disaster response assessment and triage are important specific capabilities of the SPEARR Team. The SPEARR Team can stand alone in austere conditions or be used to augment existing local military or civilian medical capabilities. Additionally, when tasked, the SPEARR Team can support medical operations directed to the local populace and wounded enemy prisoners of war. All

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team members are multifunctional and will support any function for which they are trained, if not otherwise employed.

2.2.1. **Public Health/Preventive Medicine:** The PAM-ADVON Team consists of a Aerospace Medicine Specialist (AFSC 48A3) and a public health officer. The PAM ADVON Team provides medical surveillance, epidemiology, public health, vector risk assessment, in-theater medical screening, limited early detection of chemical and biological agents, infection control, food/water inspection, communicable disease control and medical intelligence. The PAM ADVON Team members will provide the site assessment for the SPEARR Team's shelter and working location in conjunction with the host unit.

2.2.2. Flight medicine: One Aerospace Medicine Specialist (AFSC 48A3) provides aerospace medicine support, occupational medicine and surveillance, in-flight emergency response, Combat Search and Rescue (CSAR) consultation, and primary care augmentation. The Flight Surgeon is the SPEARR Team's primary clinical and administrative liaison to the AE system and is thus critical for effective and coordinated transfer of patients by the SPEARR Team. It is also highly recommended that an Aeromedical Evacuation Liaison Team (AELT) be deployed to support a SPEARR Team. While the Aerospace Medicine Specialist is the primary expert in clinical AE validation, all SPEARR Team members should be trained on procedures for clinical validation and patient movement/transfer to ensure effective and coordinated Aeromedical Evacuation of patients. The sending unit, including the SPEARR Team, is responsible for transport of patients to the flight line or other site of evacuation by doctrine. The SPEARR team would temporarily require a vehicle of opportunity for patient transport. When flying units are based at the deployment location, additional organic flight medicine support in the form of Squadron Medical Elements may be required to provide the full depth of flight medicine coverage.

2.2.3. Primary care: The SPEARR Team includes multiple physicians, nurses and technicians who can manage acute and chronic medical problems in the supported population, including acute gastrointestinal or respiratory infections, asthma, hypertension, and similar problems, as well as limited psychiatric, gynecologic, and pediatric care. The primary care physicians include the Aerospace Medicine Specialist, the internal medicine specialist, and the emergency medicine physician. The majority of the patients seen in support of contingency or disaster response personnel are expected to have Disease Non Battle Injury (DNBI) diagnoses, so all SPEARR Team personnel must be capable of assisting or providing care for these diagnoses. The Expanded Capability and Infrastructure Package (FFEE8) increases the primary care capability of the PAM ADVON Team from a PAR of 200 up to a PAR of 500.

2.2.4. Emergency medicine: The primary care personnel and emergency medicine physician provide evaluation and treatment for acute problems such as heart attacks, respiratory failure, poisonings and minor soft tissue and orthopedic injuries. The emergency medicine physician on the SPEARR Team also provides support with

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respect to mass casualty triage and perioperative care.

2.2.5. Emergency surgery: The MFST module can rapidly establish an operating theater, perform advanced resuscitative procedures, select appropriate candidates for surgery, and perform appropriate trauma, resuscitative, or other emergency surgery. Examples of subject injuries/conditions include: blunt and penetrating trauma of the thorax, abdomen, extremities, genitourinary system and the head and neck region. Management of multi-system trauma, shock/hemorrhage, respiratory failure, airway emergencies, limb revascularization, stabilization of fractures, thermal injuries, major wound debridement and other emergency care can also be performed by the MFST. Examples of emergency care, besides trauma care, that has been provided by the MFST include such things as appendectomies and surgery for incarcerated or strangulated hernias. The MFST maintains limited emergency whole blood collection and transfusion capability (20 units). The MFST can provide care for up to ten serial (48-72 hour period) damage control surgeries or twenty non-operative resuscitations without re-supply in a disaster or mass casualty scenario. Two simultaneous operative cases may be supported for a limited period of time in an emergency scenario. Anesthesia support is provided by and anesthesiologist or certified registered nurse anesthetist. General endotracheal or regional anesthesia may be performed. Anesthesia equipment and supplies include a flow over vaporizer, mechanical ventilator, or hand bag device, invasive monitoring equipment and intravenous anesthesia supplies. Perioperative care is provided by the Expeditionary Critical Care Team (UTC FFEP1) or other AFMS critical care assets within the EMEDS/AFTH system.

2.2.6. **Critical care stabilization**: The Expeditionary Critical Care Team (ECCT) Allowance Standard module and personnel from the ECCT provide critical care support including mechanical ventilation, fluid resuscitation, cardiovascular care with medications (full ACLS care available) and invasive physiological monitoring. The ECCT may provide critical care support for a maximum of 3 mechanically ventilated patients simultaneously (4 ventilators contained in SPEARR force package) and has equipment and supplies to care for 10 perioperative, or other critically ill patients over a 72 hour period. All available team members would be required to assist if the maximum number of critically ill patients (10) is encountered. Attention to work rest cycles during such challenging work conditions is paramount to staff and patient safety. The team's capability to care for the maximum number of patients has been extensively tested over the past four years in both exercise and real world scenarios. ECCT equipment and supplies are completely interoperable with other AFMS critical care assets (FFCCT, FFCCU, FFCCV). The internal medicine physician is the ECCT clinical team leader and is supported by other SPEARR Team critical care support providers (critical care nurse, respiratory technician, anesthesiologist, general surgeon, and emergency medicine physician). The surgeon will be the physician primarily responsible for postoperative decision making unless this role is delegated otherwise by the surgeon. Supplemental supplies, such as additional intravenous fluids, are provided in the SPEARR Team Expanded Capability and Infrastructure Module allowance standard (refer to section 10 of this CONOPS; Logistics). Each

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critically ill patient is expected to be aeromedically evacuated within 24 hours, consistent with the EMEDS/AFTH CONOPS, so the ECCT will not be required to care for more than 3 critically ill patients at any one time.

2.2.7. Perioperative care: Expeditionary Critical Care Team personnel provide critical care and perioperative stabilization including airway management, post-hemorrhage resuscitation, management of thermal injuries and maintain fracture stabilization. The ECCT also provides other routine pre- and post-operative care or medical critical care (e.g. – myocardial infarction, severe pneumonia, trauma not requiring surgery such as a closed head injury) for up to 10 patients over a 72 hour period, with a maximum of 3 patients being provided critical care at any one time. Other SPEARR Team members will be required to augment the ECCT when necessary. Rapid AE transport is obviously a key factor for continued effective ground perioperative care provision by the SPEARR Team. Rapid AE ensures that the team is not caring for more than 3 critically ill patients at any one time.

2.2.8. Blood Collection and Transfusion: The capability to provide a safe source for blood transfusion in critically injured patients is an important issue for the SPEARR Team. The team is trained and equipped to perform emergency blood collection and transfusion (active duty walking donor pool only), but would strive to bring 10 units of O-negative blood if airlift or other transport resources are adequate. Blood requirements will be dictated by theater medical policy.

2.2.9. Diagnostic and therapeutic support: Perioperative ultrasonography is available using a hand held device operated by the surgeon or emergency medicine physician. The SPEARR Team does not have plain film radiology capability. Laboratory support is provided by a hand held clinical analyzer which can determine blood indices such a hemoglobin, white blood cells, glucose and electrolytes. Urine dipsticks and pregnancy tests are also included as diagnostic aids. Oxygen therapy is provided through oxygen concentrators (three in allowance standard) that are compatible for use with the team's Impact 754 ventilator. The anesthesia provider has the primary responsibility for distribution of controlled medications. Multiple other providers may be delegated the responsibility of dispensing non-controlled medications.

2.2.10. Aeromedical transport preparation, coordination, and communication: The Aerospace Medicine Specialist , critical care personnel, and an Aeromedical Evacuation Liaison Team (AELT) manage arrangement of aeromedical evacuation and prepare patients for transport. SPEARR Team formal field validation testing has repeatedly demonstrated the importance of an AELT (2-person module) in ensuring rapid AE. AE policy will be consistent with the EMEDS/AFTH CONOPS (refer to section 7.2.1 of this CONOPS).

2.3. Team Composition: The SPEARR Team UTC force package includes the FFMFS, FFGL2 and FFEP1 UTCs (personnel and equipment) and the FFEE8 UTC (equipment only).

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FFMFS personnel include:

General Surgeon	045S3
Orthopedic Surgeon	045B3
Emergency Medicine Physician	044E3A
Anesthesiologist	045A3
Operating Room Nurse	046S3

FFEP1 personnel include:

Internal Medicine Physician	044M3
Critical Care Nurse	046N3E
Cardiopulmonary Technician	04H071

FFGL2 personnel include:

Aerospace Medicine Specialist	048A3
Public Health Officer	043H3

Authorized AFSC substitutions are detailed in the Manpower Force Element Listings (Mission Capability Statement and Manpower Detail) for each of the individual UTCs in the SPEARR Team force package.

2.4. Mission Scope: The SPEARR Team force package may function as an independent medical resource in austere conditions or as an early modular medical "building block" in a large number of contingency scenarios that may include disaster response, humanitarian assistance, and special operations as well as combat operations. The force package provides preventive medicine, public health, primary care, flight medicine, emergency surgery, emergency medical care, and critical care capabilities to deployed forces and ill or injured patients in far forward locations as well as rear echelon medical treatment facilities (MTF). Examples of specific missions appropriate for the SPEARR Team are:

- Medical support of a small (PAR 500) deploying Line of the Air Force unit
- Surge augmentation of an existing deployed medical facility
- Support of ramp up/down phases (early and late phases) – the most "medically vulnerable" phases of deployments
- Triage/emergency care/salvage surgery at an air field
- Surgical or critical care stabilization of injured patients in close coordination with the AE system
- Rapid augmentation of existing resources (military, civilian, or coalition assets) in support of contingency/disaster scenarios to include terrorist attack, natural or technological disasters
- Special operations support

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General Surgeon	045S3
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2.5. Deployment modes: **The SPEARR Team can be deployed in one of two modes.**

2.5.1. Man portable mode. The first mode of SPEARR Team deployment is the "manportable" mode. This mode includes the ten member team, equipment contained in backpacks and medical bags, and personal gear. The team maintains the ability to provide emergency care in the manportable mode, to include 20 major casualty resuscitations, 10 emergency or "damage control" surgical operations, and perioperative care for 10 patients over a 72 hour period. Rapid AE is essential to maintain full scope of care in the manportable mode. A bare, essential amount of food (MREs) and potable water is transported with the SPEARR Team in the backpack or manportable mode. A two-day potable water supply (6-8 quarts per person per day) is carried on the members' Load Bearing Equipment (LBE) and within their personal gear (additional canteens and "camelbacks"). The SPEARR Team will be required to function in a wide spectrum of conditions and it is recognized that significant additional water will be necessary in extreme conditions (e.g.- desert). Additional potable water is contained in the one pallet equivalent trailer mode. Rations, water, and fuel are checklist items acquired at the time of deployment (refer to SPEARR CONOPS attachment). The equipment and supplies in this mode may be carried in vehicles of opportunity such as HMMWVs (two vehicles required to carry equipment in this mode; three total for equipment and personnel), a two and a half ton or two and a half ton military truck (one vehicle total for personnel and equipment), civilian vans or pickup trucks (two vehicles total for personnel and equipment), a C-130 aircraft (one aircraft can transport 2-3 SPEARR Teams), a SHERPA C-23 aircraft (one aircraft total for personnel and equipment), CASA 212 aircraft (one aircraft total for personnel and equipment), OV-22 Osprey tilt-rotor aircraft (one aircraft required for equipment and personnel), or UH-60 Blackhawk helicopter (two total required for equipment and personnel).

2.5.2. One pallet equivalent trailer mode: The "one-pallet equivalent" trailer deployment mode includes the full SPEARR Team Allowance Standard (FFEE8), adding one trailer, shelter, power, environmental control systems (separate heater and air cooling capability), and additional medical supplies for 5 to 7 days to fully support a PAR of 500. This mode includes five to seven days of food (MREs) and 48 hours of potable water (in addition to water carried by team members) for the 10 member SPEARR Team. This SPEARR Team deployment mode requires one pallet position equivalent and all equipment and supplies are completely contained within or attached to the SPEARR Team trailer. Flexibility is essential in the programming, planning and deployment process to allow for the most efficient deployment of both the SPEARR and the EMEDS Basic modules (e.g. – larger AEF deployments). To achieve this flexibility and rapid response capability may require positioning of similar deployable assets at both AEF Lead Wings and Medical Centers. In addition to positioning of SPEARR Teams at Lead Wings and Medical Centers, SPEARR personnel and equipment should be strategically located in the European Command and the Pacific Command theaters of operations to ensure a rapid response capability in these areas of operation. These factors must be accurately reflected in documents

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such the Medical Resource Letter (MRL) in order to be applied to deliberate planning tools such as the Air Force Worldwide UTC Availability Tasking Summary (AFWUS) and the Type Unit Characteristic (TUCHA). The SPEARR Team trailer was transported on multiple different aircraft during the field test process. Examples of aircraft capable of transporting the full SPEARR trailer mode include the C-130 Hercules, the C-23 Sherpa, the CASA 212, the KC-135, the KC-10, the MH-53 (AFSOC)/ CH-53 (Marines) (internal pallet position or sling load), and the UH-60 Blackhawk (sling load). The SPEARR Team's mobility and flexibility are maximized with the design of the trailer for sling loading (designed to US Army and FAA specifications). Additionally, the SPEARR Team may bring or request a vehicle (s) for ground transport at the deployed location. This vehicle or vehicles must be capable of transporting 10 personnel and pulling 4400 pounds (net weight of trailer with equipment and supplies) over varied terrain. Such vehicles include the "Deuce and a Half" military truck, HMMWVs, or a variety of civilian vehicles. The SPEARR Team trailer has a variable, multi-use hitch compatible with military or civilian vehicles (2 - 1/8" to 2 – ½" or Pintle hook). Adequate familiarization and training on pulling and loading the SPEARR Team trailer is essential for safe and effective field operations.

SECTION 3 - OPERATIONS

3.1. General: The SPEARR Team can be ready for deployment within two hours of notification. This rapid response time is site specific and is the best case scenario for a SPEARR Team response. The two-hour response time is dependent on the collocation of personnel and equipment and on a team standing "on call" or on "Bravo" alert at all times. Transportation requirements (e.g. - ready cargo for airlift or ground trailer hitch within two hours) will establish the actual arrival time on-scene. Other SPEARR Teams may not be able to meet a two-hour response time, but remain "rapid response" assets relative to an individual unit's manpower and equipment limitations. Variations in response time may exist, therefore at locations such as AEF Lead Wings, Medical Centers, specific overseas locations, and Air National Guard units. The team must be ready to deploy via aircraft (sling load or within aircraft) or ground transport (trailer pulled by vehicle of opportunity). Initial operational capability (IOC) can be instituted within fifteen minutes of arrival at its assigned location. IOC is defined as the SPEARR Team's ability to provide essential emergency medical and surgical care. Shelters of opportunity will be utilized if the SPEARR Team is deployed in the manportable mode. Full operating capability (FOC) for the SPEARR Team should be reached within two hours of its arrival at its assigned location. FOC is defined as the SPEARR Team's ability to provide the full scope of clinical care as well as a functioning command and communication system, completed shelter erection, and initial local area public health assessment. During employment, the SPEARR Team can provide preventive, primary and advanced critical care/emergency medicine and stabilization/emergency surgery. The SPEARR Team can hold up to three critically ill patients simultaneously for up to 24 hours and is equipped to provide perioperative or other critical care for up to ten patients over a 72 hour period. Rapid aeromedical evacuation of severe illnesses/injuries (within 24

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hours of request) is critical to mission success. The Aerospace Medicine Specialist and an Aeromedical Evacuation Liaison Team (AELT) are essential elements to ensure rapid AE of SPEARR Team patients. Casualties will be treated in forward locations or received from forward, less capable facilities. Evacuation of casualties will be determined by theater evacuation policy. A stabilized patient is defined as: airway protected, hemorrhage controlled, shock controlled, and fractures stabilized. Redeployment is accomplished with rapid resupply to maintain SPEARR Team availability for subsequent missions.

3.1.1. Employment Overview: The composition and size of the SPEARR Team place it on the most lightweight and mobile end of the spectrum of units in the United States military inventory that are available to provide initial public health/preventive medicine assessment and advanced emergency medical and surgical care. Effectiveness of casualty care is related to rapid delivery of care. A rapid, flexible mobility posture and minimal airlift requirements allow the SPEARR Team to reach an area of casualty need and to institute care of casualties hours or days before larger units with additional emergency medical or surgical capabilities arrive. Emergency care is enhanced when the SPEARR Team is positioned as close as possible to areas of high risk or anticipated need. Adequate personal protective equipment and security measures must be available to ensure emergency care is delivered safely. The small size of the equipment and personnel package and limited logistical support requirements permit the team to comfortably integrate into nearly any type of host medical unit and immediately increase public health, emergency medical and surgical capability.

3.1.2. Independent Medical Operations: In scenarios where the SPEARR Team is the sole medical resource, often in austere conditions, it is capable of providing the team's full scope of medical and surgical care, command and control, and emergency aeromedical evacuation coordination duties. If the SPEARR Team is deployed in the one-pallet trailer mode, it can function in its own shelters (clinical shelter and sleep shelters); otherwise a shelter of opportunity identified by the host unit and approved by the team may be used for patient evaluation and treatment. Routine duration of employment will be one to seven days. The host unit will provide security. If the SPEARR Team has deployed in the manportable mode, the host unit must also provide shelters for clinical care and billeting, and additional food and potable water. SPEARR Team members will carry food (MREs) and water (on LBEs and in personal gear) for two days if deployed in the manportable mode. Initial fuel supply (for 1 day) will be carried with the team in all deployment modes if the carrier permits transport of this type of mission essential hazardous cargo. The SPEARR Team brings a 1 kW emergency generator in the manportable mode and an 10 kW generator in the one pallet trailer mode. The surge power requirements for the SPEARR Team have been assessed during field tests at 8 kW. Rapid AE will be required to support critical care and emergency surgery. Environment control systems currently include modular heating and cooling (fans) systems that may be inserted for each specific mission (i.e., arctic, desert, humid tropics).

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3.1.3. Augmentation of Existing Medical Resource: In scenarios requiring a medical augmentation role, the SPEARR Team will incorporate its preventive medicine assets and emergency medical and surgical expertise into existing host medical resources. The host unit triage officer and the SPEARR Team emergency medicine physician will undertake initial evaluation and triage of patients. Initial stabilization procedures will be performed and appropriate patients selected for resuscitative or emergency surgery. Limited perioperative resources in this scenario include the ECCT and any additional personnel available from the host unit. Rapid AE will be required for stabilized patients.

3.1.4. Augmentation of Definitive Care Medical Resources: In scenarios requiring augmentation of existing definitive care capability, the SPEARR Team will incorporate its public health, surgical and emergency medical expertise within existing medical resources. SPEARR Team personnel and equipment can be utilized to increase functional capability. The SPEARR Team will not be limited to resuscitative surgery or short duration critical care in this scenario, since available resources and postoperative care allow definitive care to be performed. Public health/preventive medicine capability of the host unit will also be enhanced in this scenario.

3.1.5. Tasks

3.1.5.1. Specific Tasks: UTC specific tasks are mission oriented tasks required to accomplish an assigned portion of the overall mission. The SPEARR Team's three manpower UTCs may be attached to virtually any DoD or other officially tasked medical resource, ranging in size from a battalion aid station (BAS) to a mature Air Force Theater Hospital (AFTH), Army Combat Support Hospital (CSH), or Navy Fleet Hospital (FH) Ship, amphibious assault ship, or support ship.

3.1.5.2. Mission Leader Orientation: Prior to deployment, the SPEARR Team mission leader must obtain or be familiar with the following items:

- Mission objectives
- Team predeployment requirements
- Health support to include military, civilian, or host nation medical capabilities and regional sources of supply
- Patient transportation/evacuation capabilities
- Blood supply while deployed
- Local laws, customs, and political environment to include military-civilian support agreements or memorandums of understanding
- Medical intelligence, theater medical policies and predeployment medical requirements
- Security issues
- Laws of Armed Conflict
- Status of Forces Agreements
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- Logistics support, including resupply, communications, and transportation
- Other organizations active in the area, including civilian relief organizations

3.1.6. AFSC Cross Utilization: Cross utilization for SPEARR Team AFSCs is in accordance with the Manpower Force Element Listings for each of the three manpower UTCs in the SPEARR UTC module (FFGL2, FFMFS, FFEP1).

3.1.7. Employment Role: The employment role of the SPEARR Team is to support a wide spectrum of worldwide contingency operations with rapidly deployable, lightweight and highly mobile preventive medicine, primary care, emergency surgery and emergency medical capability. The full spectrum of operations includes humanitarian and disaster response; small scale contingencies; and major theater war. Adequate personal protective equipment and training is essential for the team to engage in a wide spectrum of contingency operations.

3.1.7.1. Enemy Prisoners of War (EPW): If EPWs are treated by a SPEARR Team, coordination with security forces is required to provide guards for prisoners. Following essential care, EPWs and their medical records will be transferred to host nation or US Army EPW management authorities. Guards assigned to medical prisoners must accompany them to their ultimate destination.

3.1.7.2. Non-US Armed Forces Life Saving: If a civilian is injured secondary to US Government operations in the area of operations (AO), the theater CINC has approval authority for a SPEARR Team to treat or transport the patient. Medical care can be authorized to save life, limb, or eyesight. The SPEARR Team will coordinate patient care and/or transport through appropriate channels.

3.2. Deployment/Redeployment.

3.2.1. Deployment: The SPEARR Team module is deployed to support CINCs and other contingency commanders in preventive medicine, primary care, surgery, critical care and the rapid evaluation/evacuation of critically ill or injured patients. When appropriate, the SPEARR Team will be integrated with gaining elements, including a larger component of the EMEDS/AFTH system, at the earliest opportunity. The ability of the SPEARR Team module to deploy within two hours ensures that an appropriately prepared SPEARR Team can meet almost any short notice medical response tasking. The two-hour response time is the optimum response time and requires that personnel and equipment be co-located and be place on “Bravo” alert or on-call status. If the conditions for a two-hour response time cannot be met, the mobility and multiple deployment modes of the SPEARR Team continue to offer rapid deployment capability. Ideally, the SPEARR Team should be strategically positioned to provide rapid and mobile medical support wherever needed. In order to provide its full scope of care optimally, the SPEARR Team should remain stationary for at least 24 hours after IOC is established and should not be under direct fire.

3.2.2. Initial Operating Capability (IOC) and Redeployment: The SPEARR Team

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- Logistics support, including resupply, communications, and transportation
- Other organizations active in the area, including civilian relief organizations

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3.2.2. Initial Operating Capability (IOC) and Redeployment: The SPEARR Team

personnel and equipment packages are organized in a manner to allow for set up of emergency care equipment and initiation of casualty care in less than fifteen minutes after arrival at the deployed location. The SPEARR Team manportable mode can re-pack its equipment and supplies in less than thirty minutes and rapidly re-deploy to a new location, if the mission requires. In the one-pallet equivalent trailer mode, complete re-packing of the trailer will take 90 minutes or less. Additional time for redeployment may be necessary if the team is actively managing critically ill patients. Re-deployment to remote areas may be accomplished using the trailer in a "sling load" mode or individual backpacks and medical bags.

3.2.3. Transportation Requirements: The ten-member team, their medical equipment and supplies, and personal gear (approximately 1500 lbs.) can be airlifted within aircraft down to the size of a CV-22 tilt-rotor aircraft, or two UH-60 Blackhawk rotary-wing aircraft. The addition of the remainder of the allowance standard in a trailer brings the total weight of the combined SPEARR Team to no greater than 4400 pounds and a size no greater than one pallet position equivalent (including personal gear). Ground transportation can be accomplished with a single 2 ½ ton truck, three HMMWVs (with team member drivers), or similar sized government or civilian vehicles. Airlift of the material as a "sling load" is an additional important transport option for the full SPEARR Team AS.

3.2.4. Cargo Processing: The manportable equipment package of the SPEARR Team (backpacks and medical bags) is organized so that it can be transported as personal or professional gear. It is imperative to mission success that the same carrier transport the SPEARR Team personnel and equipment, since the ability to attain IOC in fifteen minutes is dependent upon the man portable equipment being available to team members immediately upon arrival at the site of operations. The one kW and ten kW generators must be physically and administratively prepared at all times for deployment. At least one member of the SPEARR Team must be certified to appropriately prepare the generator and other hazardous cargo for transport.

3.2.5. Weapons Courier/Narcotics Courier Requirements: A weapons courier must be assigned to accompany any shipment of weapons. Couriers will be provided with a packet of written instructions regarding en route security, subsequent storage and issue at destination sites, and redeployment procedures. The weapons courier will be fully knowledgeable of all aspects of weapons control to include marking and securing containers, escorting and marshaling, safeguarding en route, protection at deployed locations, issuance procedures, recovery of weapons issued, packing and marking, and redeployment. The anesthesia provider will normally be responsible for the security, transport and dispensing of narcotics. A locked box is provided for narcotic storage.

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3.3. Mission Planning: Medical planners must consider the following general factors when developing deployment plans for the SPEARR Team:

- Mission, enemy, terrain, troops, and time availability factors
- Political situation
- The threat, including WMD
- Operational conditions
- Host country resources available and other agencies (e.g. – NGOs) engaged in the contingency operation
- SPEARR Team sustainment factors (food, water, sanitation, power, fuel, transportation, etc.)
- Operational constraints
- Personnel and equipment status of the SPEARR Team, to include training status
- Supply status and resupply options
- Communications status
- Patient estimates
- Availability of aeromedical evacuation including response time and time to reach next destination
- Evacuation resources for movement of casualties from the SPEARR Team to the nearest suitable airfield if not co-located
- Blood supply while deployed
- Required Expeditionary Combat Support
- Special operations requirements
- Possible humanitarian assistance needs
- Maximum efficient time per surgical patient (e.g. -120 minutes)
- Maximum time per medical patient treatment (estimated based on scenario)
- Maximum surgical case load per 48-72 hours – 10 cases
- Perioperative care and other critical care– limited to a maximum of 12-24 hours prior to AE, unless integrated into a larger medical element
- Casualty documentation – written, printed, electronic; adequacy of care recording methods and transfer to subsequent care provider

SECTION 4 - COMMAND AND CONTROL

4.1. General: Command and control of medical operations for the SPEARR Team in joint, coalition, or other operations will be defined in the warning, execution, and operation orders. The gaining unified command surgeon establishes theater medical policy, which is then promulgated through the AFFOR Surgeon down through the chain of command to the SPEARR Team mission leader. SPEARR Teams may fall under the TACON of the gaining unit, which the team(s) will support, but ADCON and OPCON would normally be maintained at the JTF or component level. When functioning as an independent medical unit, the SPEARR Team will operate under the direction of the installation/deployed commander or approved civilian equivalent. When augmenting an existing medical resource, the SPEARR Team will report directly to the senior ranking medical officer or in accordance with the command and

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control structure of elements such as the EMEDS/AFTH.

4.2. Local Command Authority: SPEARR Teams will organizationally align as directed by the tasking authority as identified in the deployment messages. When employed to augment existing EMEDS/AFTH assets, the SPEARR Team will integrate into the host's command and control structure. The official commander of the SPEARR Team will be the team's senior ranking officer in the deployed location, but actual clinical/operational leadership will be assigned to appropriate team members on a mission specific basis.

4.3. Multi-National Operations: Command and control of medical operations in joint or coalition environments will be defined in the warning, execution, and operation orders.

SECTION 5- INTELLIGENCE/NATIONAL AGENCY/SPACE SUPPORT

5.1. Intelligence: Accurate medical intelligence is crucial to threat identification and application of appropriate preventative medicine measures. Prior to a deployment for sustained operations, a deployment brief will be delivered to SPEARR Team for the AOR. During the employment stage of an operation, the SPEARR Team will require periodic briefings for their deployed location and for areas they will be transiting while conducting medical operations. The host unit senior medical officer or other designated official US representative (in bare base scenarios) will coordinate communication of medical intelligence information.

5.2. National Agency: The Defense Intelligence Agency (DIA) and its subordinate organization, the Armed Forces Medical Intelligence Center (AFMIC), the World Health Organization (WHO), Pan American Health Organization (PAHO), and the Centers for Disease Control and Prevention (CDC) are examples of primary sources for current medical intelligence.

5.3. Space: Space derived global positioning, satellite communications, intelligence, weather updates, and troop movements are examples of valuable information provided by space based resources. This information is primarily acquired through base support directorates.

SECTION 6 - COMMUNICATIONS/COMPUTER SYSTEM SUPPORT

6.1. Communication and Computer Systems Resources: The communication and computer systems requirements vary depending on the mode of deployment. The man-portable mode will deploy with satellite communications (SATCOM) capability, land mobile radios (LMRs), and a cellular telephone (obtained on a mission specific basis). The one pallet equivalent trailer mode will deploy with the SATCOM, LMRs, cellular phone, one laptop computer, a small printer/fax/copier machine and a digital camera. Minimal weight and cube and the ability to function in austere environments are essential for SPEARR Team communications and systems resources (e.g. –

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SATCOM must have be capable of functioning on battery power). A software system to record and transmit detailed patient epidemiological information (e.g. - Desert Care II, Global Expeditionary Medical System-GEMS) is included in the SPEARR Team information management/information technology (IM/IT) package, and other software systems may be required to specific AORs for Joint Task Force (JTF) Deployments. Future systems will interface with the Global Combat Support System (GCCS) to provide full integration with other ECS functional areas. The SPEARR Team communication and computer resource package provides word-processing, database management, graphics, and local area network/wide area network (LAN/WAN) interface, and communication for patient movement, situation reports, and logistics capability. All communication and systems resources for the SPEARR Team will be compatible with the EMEDS/AFTH system and Air Force Theater Medical Information Program (TMIP). Worldwide capable cellular telephone resources may be required for reach back capability, and would be most frequently used in operations such as humanitarian relief operations and disaster response. Cell phone use may be limited due to communications security and international system compatibility issues. The SPEARR Team deploys with limited resources and may be independently operational prior to arrival of other USAF resources, making the need for flexible and reliable communication particularly important for mission success.

6.2. Secure/Nonsecure Communications: The SPEARR Team will utilize the AELT's intrinsic SATCOM with STU III phone or host unit resources for secure communication. Nonsecure communication will include SATCOM, LMRs, FAX, and electronic mail through intrinsic or host unit resources. Team members should be familiar with procedures for secure voice communication using the STU III phone in conjunction with the SATCOM.

6.3. Organic Radios: Non-secure radios may be utilized by the SPEARR Team for intra-team communication. Scope Shield tactical radios can be used in the encrypted mode for secure LMR transmissions. Operation of these devices outside the United States must be approved through the appropriate theater approval authority.

6.4. Classified Information: Classified information that is not under the personal control and observation of an authorized person is to be guarded or stored in an approved locked security container of the host unit.

SECTION 7- INTEGRATION AND INTEROPERABILITY

7.1. General: Integration of deployed SPEARR Teams, as a module within the Air Force EMEDS/AFTH system of UTCs, is critical for successful medical operations. Integration needs to occur with the Line for expeditionary combat support (ECS), EMEDS/AFTH operations and aeromedical evacuation. The SPEARR Team's unique mobility and rapid response in disaster and other contingency scenarios also mandates effective integration and communication with Joint, Air Reserve Component, US national/government/international coalitions and non-government organizations (NGOs). ECS requirements include, but are not limited to water (potable water

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needed after 48 hours), fuel (one day fuel supply carried with SPEARR Team when authorized), transportation, logistics, and security. Rapid AE is essential to mission success. The SPEARR Team is not capable of furnishing medical supplies and equipment to casualties during the evacuation process due to the limited intrinsic SPEARR Team equipment and supplies. The SPEARR Team allowance standard is completely compatible with the AE system's CCATT teams. To the maximum extent possible, the AE system must provide all en route supplies and attendants. En route medical needs must be coordinated within the AE system. When specialized supplies cannot be prepositioned (use of opportune airlift), the SPEARR Team will provide only those supplies necessary for the patient to safely reach the next level of care.

7.2. Interoperability

7.2.1. Aeromedical Evacuation (AE):

7.2.1.1. The Expeditionary Aerospace Force provides fixed wing, common user aircraft for patient evacuation to support combat arms during contingencies. AE assets will be postured to support the casualty requirements. Air Mobility Command is the lead MAJCOM for worldwide AE, providing forces and equipment to ensure personnel are organized, trained, and equipped to perform both the inter-theater and intra-theater AE missions. The SPEARR Team provides initial stabilization of critically ill casualties, resuscitative surgery and limited perioperative care (up to 24 hours). The SPEARR Team has no prolonged inherent holding capability (a maximum of 4 critically ill patients simultaneously for up to 24 hours; a total of up to 10 patients over 48-72 hours); therefore, rapid AE support or timely integration into a larger medical unit is critical to mission success.

7.2.1.2. A prerequisite for rapid AE support is the simultaneous deployment of an Aeromedical Evacuation Liaison Team (AELT). The AELT should be co-located in close proximity with the SPEARR Team. The size of the AELT will be situational-driven; however, a two-person team consisting of a flight nurse or Medical Service Corps officer and one radio operator is ideal for most situations. The flight nurse is preferred because of the clinical as well as administrative capabilities he/she brings to the multifunctional, integrated AELT/SPEARR Team UTC package. Ideally, the AELT will deploy with its fully loaded HMMWV (total equipment, supply and vehicle package of only two pallets), which will provide it with food, water, and shelter. However, if necessary, the AELT will deploy with only backpacks containing communications equipment, and minimal food, water, and shelter. The preferred communications equipment for the AELT is an International Maritime Satellite (INMARSAT) telephone, secure telephone, and a military satellite communication set. The AELT will coordinate with the AE Cell in the applicable Air Mobility Division, and the Patient Movement Requirements Center, as appropriate, to ensure rapid patient flow to appropriate levels of care. The AELT will also provide the AE expertise to ensure required information, especially unique requirements such as equipment/medication needs, are provided to the AE system, and patients are properly prepared for evacuation.

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7.2.1.3. The key to successful AE coordination is thorough planning by the AEF/Theater planning function, in close communication with the SGX Operations office at HQ AMC. The specific contact point at HQ AMC/SGX is the deployment office (SGXO; DSN 576-3389 or 576-1913 for 24-hour available contact), which has a depth of experience in planning for AE operations and can provide valuable assistance to the AEF/Theater planners. The following are important issues that need to be resolved before deployment orders are written:

7.2.1.3.1. What are the potential casualties expected from the overall deployment, i.e., gun shot wounds, dehydration, motor vehicle accidents, gastrointestinal disorders? Of these potential casualties, which ones would normally result in aeromedical evacuation, and the estimated acuity/workload for the casualties?

7.2.1.3.2. Where will the intermediate staging base (ISB) be located, how far is the ISB from the deployment location, and what kind of MTFs, especially U.S. military MTFs, are located in the AOR? Generally speaking, the farther away the ISB is from the deployment location, the greater the need to locate AE elements such as AELTs, AE crews, CCATTs, and Patient Movement Items (PMI) teams near the deployment location.

7.2.1.3.3. How far is the SPEARR Team site from the nearest airfield capable of handling USAF fixed wing aircraft, and how will patients be transported from the SPEARR Team site to this airfield? More specific, what kinds of transportation assets are readily available in the local area (Army Medevac, host nation ambulance service, U.S. military vehicles of opportunity)?

7.2.1.3.4. What will be the airlift operational tempo at the deployed location and the ISB? Presumably, the higher the tempo, the easier it will be to secure lift for AE.

7.2.1.3.5. What Patient Movement Items (PMI) issues should be considered, such as whether to deploy a PMI team, what PMI equipment should be placed in standby for exchange with the SPEARR team, and how will PMI be transported from PMI centers to the SPEARR Team location. Many AE patient movements require PMI equipment to be moved with the patient. Since the SPEARR Team has a very limited amount of equipment, they cannot be depleted through aeromedical evacuation of their patients.

7.2.1.4. The Expeditionary Critical Care Team UTC (FFEP1) within the SPEARR Team UTC force package is completely interoperable with the AE system's Critical Care Air Transport Teams (CCATTs). The Expeditionary Critical Care Team provides critical care support for the EMEDS/AFTH system on the ground and is not specifically designed or trained for air transport of patients. Civilian AE assets may be utilized depending on the scenario.

7.2.2. EMEDS/AFTHs: The SPEARR Team is a modular component of the EMEDS-Basic and builds to a complete EMEDS/AFTH or mature AFTH when additional UTCs are added (refer to EMEDS/AFTH CONOPS).

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7.2.3. Joint and Total Force Operations: The SPEARR Team has been developed, along with the rest of the EMEDS/AFTH system, to be interoperable within a Joint theater of operations. Equipment and supply packages, doctrine, and training principles all emphasize the current requirement to function in the majority of mission scenarios as an integrated, Joint service medical capability. Specific modifications to the SPEARR Team were developed for effective Total Force integrated operations. Total Force assets, such as the Air National Guard's Care Force Teams, were researched to ensure with Total Force manpower, equipment, and doctrine.

7.2.4. US National/Government Support: The SPEARR Team's mission flexibility make it a valuable resource for US National/Government applications such as presidential support missions and regional field support of other federal organizations such as the Federal Bureau of Investigation. These applications require detailed coordination and approval.

7.2.5. Coalition Forces: The SPEARR Team concept was modeled after and developed concurrently with similar international medical assets (e.g. – British Field Surgical Teams and the Chilean ERSAM module). The current international environment and the US National Security doctrine of Global Engagement mandate a SPEARR Team requirement to integrate effectively in international coalition operations.

7.2.6. Nongovernment Organizations (NGOs): The rapid response of the SPEARR Team permits tasked emergency medical and surgical support to a contingency/disaster response force, which is usually provided significantly earlier than similar support provided by NGOs. Phased response would include SPEARR Team medical coverage during the early or "vulnerable" phase of the deployment (5-7 days) followed by the larger NGO/or other asset deployment later in the response.

SECTION 8- SECURITY AND FORCE PROTECTION

8.1. Operations: The Defense Forces Commander (DFC) or civilian counterpart shall be responsible for all security operations, physical security, and force protection issues. Current threat assessment and threat condition (THREATCON) will drive local security measures.

8.2. Physical Security: SPEARR Team personnel are responsible for following all personal protective measures as outlined in theater security briefings, force protection requirements, and OPORDS. All SPEARR Team members will attend security, antiterrorism, and weapons training as required. Defense Forces Commander and security forces will provide technical advice and recommendation to SPEARR Team personnel, as requested. SPEARR Team members may be issued weapons when authorized in the Deployment Order.

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8.3. Personal Protection: SPEARR Team personal protection includes physical security and also requires theater specific personal protective measures and personal protective equipment. The adequate force protection (including personal protection issues) of deployed UTC personnel is the responsibility of the local MTF and MAJCOM command structure. Funding and acquisition issues for deployed UTC personal protection are the responsibility of the same command structure.

SECTION 9 - TRAINING

9.1. Training: Initial training for personnel assigned to the SPEARR Team UTC force package will be coordinated according to the AF Master Training Plan and AFI 41-106. The training will be fully integrated with other medical readiness training such as that for the EMEDS/AFTHs. Training will be provided to individuals, with priority given to those UTCs scheduled to be the first to deploy. Maintenance of clinical skills and team training will be incorporated into continuous and annual sustainment training programs at the unit level. All assigned SPEARR Team members must participate in this training. Any formal training associated with the EMEDS/AFTH or other gaining medical units will be accomplished and documented. Training may be conducted in conjunction with sponsored local training or in conjunction with operational deployments. A deployable SPEARR Team training program has been tested and will be formalized. Joint training is encouraged to foster effective operational relationships and to enhance capabilities of each service's deployable medical assets. Joint activities for the SPEARR Team may include experiences at the Joint Trauma Training Center (JTTC) or Joint Readiness Training Center (JRTC). Personnel assigned to force package UTCs should be familiar with all SPEARR Team operations and equipment. SPEARR Team personnel will also require a detailed knowledge of larger EMEDS/AFTH integrated operations. The roles of individual SPEARR Team members will expand during deployments and they will be expected to perform in multi-functional roles.

9.2. Ancillary Training: **SPEARR Team members must complete additional training prior to deployment. Weapons training, driver's training for military vehicles, land navigation, communications, hazardous cargo, weapons courier and SPEARR Team specific WMD training are required. At least two members must be trained in medical logistics principles to include reachback resupply. These additional training items will be introduced during formal EMEDS training. All team members are required to have HMMWV training to increase the team's flexibility and lessen the need for tactical ground transportation. All physician members of the SPEARR Team must be current in Advanced Cardiac Life Support (ACLS) and Advanced Trauma Life Support (ATLS). Nurse members of the SPEARR Team should attend the Trauma Nurse Casualty Course (TNCC) and it is highly recommended that they attend ACLS and ATLS courses. It is recommended that surgical technicians (authorized substitutions on UTC FFMFS) complete ACLS, ATLS, and/or Basic Trauma Life Support (BTLS). The Combat Casualty Care Course (C4) is strongly recommended for all SPEARR Team members. Physician members of the SPEARR Team are**

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9.3. Medical Readiness Training: Training will be IAW AFI 41-106, *Medical Readiness Planning and Training,* and will cover the entire spectrum of deployed medical operations and all phases of deployment, employment, and redeployment. Units tasked to support SPEARR Teams will tailor training to reflect the full spectrum of operations for which the UTC may be tasked in the respective OPLAN. The majority of SPEARR Team members are assigned to UTCs within the EMEDS/AFTH system and will therefore be fully integrated into the EMEDS/AFTH training program.

9.4. Team Training on Equipment: The SPEARR Team equipment package will be assembled at least annually for inventory, preventive maintenance of equipment, and team training as part of maintaining overall mission readiness. More frequent team training with equipment and supplies is strongly encouraged.

SECTION 10 - LOGISTICS

10.1. SPEAR Support Requirements: The SPEARR Team is responsible for coordinating all operating support required during deployments including power, security, billeting, rations, shelter, water, transportation, waste disposal, communication, re-supply of medical items if necessary, and any other items determined necessary for the SPEARR Team to accomplish its mission.

10.2. War Reserve Material (WRM): The objective of the medical WRM program is to identify, acquire, pre-position, and maintain the materiel needed to support the forces and missions specified in Defense Planning Guidance and contingency plans. AF Manual 23-110, AF Medical Materiel Management System (Volume V), provides guidance for WRM assets, outlining when commanders may loan, use, and expend WRM assets. WRM program authorizations are published annually by HQ USAF/SG in the Medical Resource Letter, which contains personnel and equipment UTC taskings and storage locations. Medical materiel for SPEARR Team deployable assets is identified in the SPEARR Team Force Package AS. A common user name list is included as an attachment to the CONOPS of the individual UTCs to improve SPEARR Team and logistical integration.

10.3. Equipment: The SPEARR Team is comprised of four UTC packages: the FFMFS (Mobile Field Surgical Team) package has five back-packs, a 1 kW generator, a fuel container and two folding NATO litters; the FFGL2 (Prevention Aerospace Medicine Team) package has two back-packs and two hand-carried

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medical bags; the FFEP1 (Expeditionary Critical Care Team) has three back-packs and eight hand carried medical bags, and the FFEE8 (Expanded Capability and Infrastructure Module) has six medical supply bags and also includes large SPEARR Team infrastructure items such as shelters (single large shelter and two small sleep shelters), large (10 kw) generator, and the trailer. The first three UTC packages (manpower and equipment) are designed to be used in a man-portable mode and can be transported in vehicles of opportunity such as HMMWVs (three required for team members and equipment), civilian or military vans or pick-up trucks (two required), UH-60 Blackhawk helicopters (two required), an OV-22 Osprey tilt-rotor aircraft (one required), or larger aircraft such as a C-130. . Each set of backpacks and medical bags is designed to carry a portion of the team's capability to treat primary care conditions and critically ill or injured patients. All backpacks and the medical bags are required for the team to function as designed, and be able to maintain "man-portability." Additional equipment in the fourth UTC (equipment only) includes: a 32 by 20 foot shelter, two team sleep shelters, trailer which is sling loadable and is equivalent to one pallet when loaded on an airframe, portable power (10 kW and 1kW generator), environmental control systems (separate heating and cooling systems are modular and may be inserted for specific missions/climates), computer/communications equipment, and additional clinical equipment and supplies. SPEARR Team equipment and personnel must be deployed together in the same carrier to ensure IOC/FOC timelines are achieved.

10.4. Personal Equipment: The SPEARR Team is expected to function in all but the most extreme environmental conditions. Personal equipment items (including personal protective equipment) should be provided at home station IAW AFI 10-403, *Deployment Planning,* AFMAN 23-110, *USAF Supply Manual,* and MAJCOM policy. The provision of appropriate personal protective items is absolutely essential for SPEARR Team mission completion and team member force protection.

10.5. Storage Requirements: SPEARR Team assets are stored in a "ready" mode for rapid deployment while in-garrison. At a minimum, storage facilities will provide security and adequate environmental controls to prevent damage or loss of potency to dated and temperature-sensitive material. All surgical instrumentation will be stored in a ready to use condition (sterilized). All battery-operated equipment will be continuously charged so that they are operational upon notification of the warning order. The ten kilowatt and one kilowatt (MFST) generators will be stored in a condition ready for deployment (drained, purged, and with necessary HAZMAT documents). Other hazardous material (e.g. – fuel and fuel containers) will be ready for deployments at all times.

10.6. Supplies: Equipment and supplies are designed to provide single mission support for up to ten serial emergency or damage control surgeries (including perioperative care) or 20 non-operative resuscitations, and public health/primary care for a PAR of 500 personnel. The design and portability of the team does not allow for compressed gas resources and oxygen concentration systems are currently used for medical oxygen supply. There are significant limitations in the amount of crystalloid

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resuscitative fluids that can be carried in the man portable mode and additional fluids are transported in the SPEARR Team trailer mode. The support or gaining unit, in accordance with the principles of Agile Combat Support (ACS), will coordinate SPEARR Team resupply. Each UTC in the SPEARR Team force package has an additional equipment package that allows expansion of clinical capability or casualty care sustainment. Items such as rations, water, and fuel are on checklists and are acquired at the time of deployment (refer to SPEARR CONOPS attachment). The MFST expansion package allows for the emergency medical or surgical care of 5 additional patients. The ECCT expansion package allows for the care of 5 additional critically ill, injured or perioperative patients for up to 24 hours each. The PAM ADVON and Expanded Capability and Infrastructure Package expansion or resupply packages provide additional preventive medicine /public health and primary care capability. The initial ECIM expands the PAM ADVON capability from a PAR of 200 up to a PAR of 500 personnel. The optimal SPEARR Team mission length is 5-7 days and anticipated longer deployments or increased threat or PAR should drive medical planners to task larger assemblages such as the EMEDS Basic. The SPEARR Team force package UTCs expansion or resupply packages ensure that the transition to larger UTCs occurs without interruption in the quality of casualty care capability and also provides more precise modular resupply of these UTCs once they are embedded in larger assemblages (including Joint or coalition scenarios).

10.7. Biomedical Equipment Maintenance: SPEARR Team medical equipment maintenance is provided on site at the operator level only, unless the team is deployed with a larger medical unit such as the EMEDS Basic. Equipment repairs beyond the capability of the operator will be managed by priority equipment replacement, or by a Biomedical Equipment Technician in larger medical force package, such as the EMEDS Basic. All equipment must be reliable (e.g. – heater and generator) and adequately maintained prior to deployment.

10.8. Sustainment: The recommended SPEARR Team mission employment phase is five to seven days for contingency response missions. The SPEARR Team is designed, for crisis action and deliberate planning purposes, to serve as a short stand-alone or initial module for an EMEDS Basic or larger asset. A 10 day resupply or sustainment package provides support for SPEARR Team missions beyond seven days, consistent with other EMEDS assemblages which have initial seven day supply capability and 10 day resupply capability. Reachback resupply and sustainment must be considered during the planning process to insure adequate transportation networks are available in theater of operations to ensure supplies will be deliverable within established reachback timelines (72 hours). Refer to Expeditionary Medical Logistics (EML) CONOPS when planning medical logistics reachback. Line item requisitioning capability may commence within 24 hours after arrival.

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SECTION 11- SUMMARY

11.1. Summary: The SPEARR Team UTC force package is a lightweight, mobile, highly capable AFMS medical asset that provides public health/preventive medicine, primary care, flight medicine, advanced casualty resuscitation, emergency/damage control surgery, emergency medical care, critical care and aeromedical evacuation coordination. SPEARR Team casualty care and assessment has been developed for a population at risk of 500 personnel for a period of 5 to 7 days. All team members are multifunctional and are prepared to provide a broad scope of care for the full spectrum of EAF contingency operations. The SPEARR Team is an extremely mobile and flexible asset and is able to operate independently for brief periods of time or augment existing capabilities of host medical units. Force health protection is promoted by inserting a wide spectrum of medical capability in a very small forward footprint. The SPEARR Team force package is comprised of UTCs within the EMEDS/AFTH system and the force package CONOPS and allowance standards have been developed to be fully interoperable with the CONOPS for the Expeditionary Medical Support and Air Force Theater Hospital system.

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APPENDIX IV
Collectively Protected EMEDS

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COLLECTIVELY PROTECTED

EXPEDITIONARY MEDICAL SUPPORT/

AIR FORCE THEATER HOSPITAL

(CP EMEDS)

20 MARCH 2001

DRAFT

157
OPERATION AND MAINTENANCE MANUAL

COLLECTIVELY PROTECTED

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CHAPTER 1

INTRODUCTION AND GENERAL INFORMATION

1-1 SCOPE

This manual provides instruction for the set-up, operation and maintenance of the Collectively Protected Expeditionary Medical Support/Air Force Theater Hospital, from now on referred to as CP EMEDS. Because the majority of the components of the CP EMEDS consist of equipment found elsewhere in the Air Force inventory, this manual will reference existing technical manuals whenever possible. Refer to Table 1 for a list of applicable manuals.

1-2 PURPOSE AND USE

The mission of the Air Force Theater Hospital (AFTH) is to provide individual bed-down and theater-level medical/dental services for deployed forces or select population groups within the entire spectrum of Small Scale Contingencies (SSCs) through Major Theater War (MTW). Components of the AFTH consist of the Small Portable Expeditionary Aeromedical Rapid Response (SPEARR) Team and the Expeditionary Medical Support (EMEDS) Basic, EMEDS +10 and EMEDS +25. The CP EMEDS takes that capability one step further by enabling medical personnel to deploy and set up in chemical and biological threat areas and operate in chemically and biologically active environments while minimizing impact to the AFTH mission. Currently the EMEDS +25 is the only configuration that has been verified to provide chemical/biological (CB) protection when operated in accordance with the instructions contained within this manual.

1-3 APPLICABLE DOCUMENTS

Table 1. List of Related Publications

Number	
Commercial Manual	Alaska Medical Shelter System
Army TM 3-4240-338-12&P	M28 Collective Protective Equipment, Operator & Unit Maintenance Manual (includes Repair Parts and Special Tools List)
TM 9-4120-411-14	Field Deployable Environmental Control Unit
TM XXX	EMEDS/AFTH Owners Manual
Army TM 10-8340-224-13	Operator and Maintenance Manual for Tent, Extendable, Modular, Personnel (TEMPER)
Army TM 43-0003-29	Demilitarization Procedure, FSC 4240, Filters
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1-4 SYSTEM DESCRIPTION

The CP EMEDS is an enhancement to the existing EMEDS +25 allowing theater operations within a CB threat area. This enhancement is accomplished through addition of components that provide CB protection to the Alaska Medical Shelter System (AKMSS). The CP EMEDS +25 has the capability to provide 24-hour sick call, 25 inpatient beds, and emergency medical care to a population at risk of 3000 - 5000. The following are additional capabilities: Medical command and control, preventive medicine, trauma resuscitation and stabilization, general and orthopedic surgery, critical care, primary care, aeromedical evacuation coordination, aerospace medicine, urgent care, dental, and limited ancillary services.

The chemical and biological protection is provided primarily with the addition of chemical/biological (CB) liners, filtered positive air pressure, and airlocks to allow controlled entry and exit of the Toxic Free Area (TFA). Climate control and positive air pressure is maintained through the use of chemically hardened Field Deployable Environmental Control Units (FDECUs). The FDECUs with the addition of motor blowers provide heating, air conditioning, and filtered make-up air using sealed filters to remove contaminants from the ambient air. See Figure 43, CP EMEDS +25.

WARNING

Layouts other than that proposed in Figure 43 may invalidate the collective protection properties of the CP EMEDS.

1-5 EQUIPMENT CHARACTERISTICS, CAPABILITIES, AND FEATURES

1-5.1 Used in conjunction with EMEDS +25 to provide an environmentally controlled chemical and biological protected hospital.

1-5.2 Protects against nuclear contamination in the form of dust and debris.

1-5.3 Compatible with commonly available US, foreign and military power sources including emergency power systems (i.e. 110/220/240/VAC, 50/60Hz).

1-5.4 Transportable using forklift, flat bed trailers and/or trucks.

1-5.5 Equipped with airlocks that allow decontaminated personnel to move from a contaminated area into the hospital without introducing contaminants.

1-5.6 Allows a casualty surge rate of 10 litter and 10 ambulatory patients per hour over a 4-hour period after the patient decontamination process.

1-5.7 Provides environmental control in the Toxic Free Area (TFA) that allows users to control internal temperatures within the range of 60 – 90 degrees

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1-5.8 Incorporates automatic detection from loss of overpressure.

1-5.9 Capable of repeated use during routine operations and training exercises with a minimum of servicing and maintenance.

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1-6.1 Alaska Medical Shelter System (AKMSS). The AKMSS, model number AKMSS - 2032.5, is a shelter designed to protect personnel and equipment in all types of climate and terrain. It includes a 20'wide x 32.5' long x 10' high free-span shelter, a 20'x 8'x 10' extension shelter, and a 7'x 8'x 9' vestibule shelter. The shelters are modular, supported by an aluminum frame and covered with military spec vinyl fabric. It can be used in all types of weather such as, snow, rain, hail, and wind and on all types of terrain such as desert sand and frozen tundra. A 463L pallet and forklift compatible transport container is provided for each shelter. Refer to the Alaska Industries commercial manual for detailed component descriptions.

The chemical/biological liners and adapters are made of materials that should not undergo prolonged exposure to direct sunlight. Take precautions to minimize exposure. The material becomes brittle after being exposed for extended periods of time. If the liners or adapters display characteristics of prolonged exposure, they should be replaced before deploying to a threat environment.

WARNING

1-6.2 Chemical/Biological (CB) Liners. The CB liners provide a barrier within the shelter allowing personnel to perform duties without wearing individual protective equipment when combined with Nuclear, Biological and Chemical (NBC) filters. The liners are made from polyethylene-saran plastic that is resistant to known CB toxic agents in the form of liquid and vapor gases. The liners are provided in butyl bags for storage and come with a mating two track closure, or flange, that allows liners and adapters to interface. The liners consist of a 32' liner, an 8' extension liner and an 8' long vestibule liner. The 32' CB liner is equipped with two electrical and four environmental control duct sleeves and two CB liner membranes. The 8' extension liner is equipped with twelve electrical duct openings and three CB liner membranes. The four membrane openings of the 8' extension are double flanged. This allows a CB membrane to be inserted to close off shelters that have possibly become contaminated. The 32' liner is compatible with both the AKMSS and the Tent, Extendable, Modular, Personnel (TEMPER) systems, thus duct openings and exterior straps are provided for both systems. Exterior straps are used to attach the liners to the shelter frame and are coded for ease of use. Straps used for the AKMSS only are marked with a 3" round red ink mark, TEMPER only straps will have a 3" round black ink mark, and straps with no markings are for use with both systems.

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1-6.3 M-28 Collective Protection Equipment (CPE). The M28 CPE used with this application consists of Protective Entrance (PE) airlocks, PE airlock adapters, recirculation filter assemblies, and 200cfm motor blowers. Each of these components is described below. For information on parts and trouble shooting of these components refer to the M28 CPE TM 3-4240-338-12&P.

1-6.3.1 Protective Entrance (PE) Airlock. The PE airlock, NSN 4240-01-331-2938, allows personnel to move from contaminated areas into the Toxic Free Area (TFA) of the shelter and assists in maintaining pressure within the shelter. It consists of a collapsible aluminum support frame and a butyl coated fabric enclosure. It is triangular in shape with fabric doors on each side. Each door has a window, a slit entrance with hook and pile fasteners and hook and pile operated vents for regulating the pressure within the airlock and TFA. One side has a flange that is used to connect the PE airlock to a PE airlock adapter. The inner door comes with a magnehelic gauge to measure the pressure within the shelter. The magnehelic gauge located within the airlock measures pressure of the airlock and is equipped with a timer to allow proper purge rate. A light adapter cord is included to allow the interior light to be plugged into the shelter electrical distribution box. When erected the PE airlock is free standing.

1-6.3.2 Protective Entrance (PE) Airlock Adapter. The PE airlock adapter, NSN 4240-01-460-9055, allows the PE airlock to be attached to any membrane opening of the CB liner. This adapter is equipped on one end with hook and pile fastener to allow the protective entrance to be attached and two tracks on the other end to allow interface with the membrane opening.

1-6.3.3 Recirculation Filter Assembly. The recirculation filter assembly, NSN 4240-01-348-5257 is a portable self-contained unit. Using a recirculation filter element, NSN 4240-01-332-2068, it is used to filter any residual NBC contaminants inside a deployed CB liner. The cover is attached to the housing by four link-lock fasteners. The housing accommodates the blower, the replaceable filter element and the power switch. The power cord provides connection to a standard 110 VAC/60Hz socket. Air enters through the air inlets and is forced downward through the filter element exiting through the bottom air outlets.

1-6.3.4 Support Kit, Tent Extendible. The support kit, NSN 4240-01-406-9350, contains a motor blower assembly, hoses, gaskets and Field Deployable Environmental Control Units (FDECU) interfacing cables. It also contains spare liner material for patching the liners. The motor blower assembly provides a minimum of 200cfm to the shelters through the Hermetically Sealed Filter Canisters (HSFCS) and hardened FDECUs. Two motor blowers are used with each hardened FDECU. It

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operates on 110VAC/60Hz or 220VAC/50Hz. The time totaling meter indicates total operating hours of the motor blower assembly, currently rated for 500 hours. There is a maintenance kit, NSN 5180-01-331-2921, which extends the service life of the motor blower. It contains two motor blowers, a time totaling meter, four gaskets and an air filter.

1-6.4 Liner Repair Kit Package. The M28 liner repair kit package consists of: 1) emergency knives to cut liners and shelter material in case of emergency egress; 2) pressure sensitive (duct) tape; 3) chemical protective adhesive patches and chemical protective tape made from saranex used to patch or repair the liners as required.

1-6.5 Bump-Through-Door (BTD) Airlock. The BTD airlock is a multipurpose airlock that allows the entry and exit of personnel and supplies. It provides a high flow rate of filtered air to ensure a rapid purge of airborne contaminants during entry and exit. Air is recirculated through a FFA 580 – 600 cfm fan filter assembly; filtered air also flows through the airlock from the shelter via a vent and leakage points around the doors. With interior dimensions of 15-ft length, 5.25-ft width, and 6.75 height, the airlock has space for two litter-borne patients on standard NATO litters with litter bearers or 12 ambulatory personnel. Complete operation and maintenance is contained in Appendix B of this manual.

1-6.6 Fan Filter Assembly, Type FFA-580-100. The FFA-580, NSN 4230-01-101-3611, is an all-weather portable positive pressure NBC filtration system that provides up to 600 cfm of clean, breathable air to the shelters. In the case of the BTD airlock where the blower unit is attached, it allows for a greater recirculation of the air within the airlock, thus reducing the purge time. The unit is modular in design and allows for multiple units to be combined for requirements greater than 600 cfm. The skid base frame construction allows for units to be readily stacked. The unit uses standard type-classified M56 filters. The power requirements are 120/208 VAC, 3 phase, 50/60 Hz. The CP EMEDS +25 system also uses a modified FFA-580 type fan filter assembly rated at 400 cfm. This unit is designed to be used with the hardened FDECU in order to provide clean filtered make-up air to the shelter. The modified FFA-580 blower is intended to replace the M28 motor blower support kit currently used with a hardened FDECU.

1-6.7 Nuclear Biological Chemical (NBC) Filter Set, Type M56A1. Three gas particulate NBC filters, NSN 4240-01-369-6533, are used in each FFA-580, 600 cfm Filter Blower Unit and two in the 400-cfm unit.

1-6.8 Field Deployable Environmental Control Unit (FDECU). The FDECU, NSN 4210-01-449-0459, is a 5-ton, heat pump unit that provides heating and cooling to the shelter. It comes with a remote box assembly allowing the user to turn the system on and regulate the environment controls from inside the shelter. It can be used in NBC or non-NBC mode. When used in the NBC protection mode, the NCB

indicates total operating hours of the motor blower assembly, currently rated for 500 hours. There is a maintenance kit, NSN 5180-01-331-2921, which extends the service life of the motor blower. It contains two motor blowers, a time totaling meter, four gaskets and an air filter.

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hardening kit must be installed prior to use. This kit consists of an NBC return air adapter, chemically hardened return and supply ducts and a filtered make-up air blower assembly. For more information on the FDECU see TM 9-4120-411-14.

1-6.9 Hermetically Sealed Filter Canister (HSFC). The HSFC, NSN 4240-01 178-9936, is a gas–particulate filter intended for use with the FDECU and M28 motor blower. One HSFC is used with each motor blower assembly for a total of two per FDECU. These filters clean toxic air before it enters the CP EMEDS. Each filter is rated at 200 cfm. It is imperative that damaged filters are not used. To prevent damage it is recommended the canisters remain in their shipping crate during use. (Figure 10 shows HSFC on top of shipping crates)

1-6.10 Low Pressure Alarm (LPA). The low pressure alarm, placed within the shelter, is designed to monitor the interior pressure of the TFA and provides an audible alarm if the pressure rises too high or drops too low. It is equipped with a LCD readout indicating the shelter pressure, a low and high pressure LED and an audio on/off switch. The alarm activates when the pressure of the system drops below 0.40 inches of water gauge (iwg) or rises above 0.85 iwg. There is a switch to silence the alarm; however, the red LED warning light will illuminate until the condition is corrected. Once the pressure of the shelter has risen above 0.45 iwg or dropped below 0.75 iwg, the alarm will automatically reset itself. The low pressure alarm can be mounted onto the electrical distribution box on the light box pole with its mounting bracket or placed on a table. The low pressure alarm uses a standard 110V plug and has a plastic tube sensor that must be routed to the outside of the shelter for proper pressure readings.

1-6.11 Tent, Extendable, Modular, Personnel (TEMPER) Vestibule and Frame Assembly. The TEMPER vestibule and frame assembly, NSN 8340-01-198-7621 and NSN 8340-01-186-3010 are used to protect the airlocks. One is needed for each PE airlock and two are needed for each BTD airlock. It consists of a mildew and flame resistant, coated, polyester duck material and three aluminum vestibule frame assemblies to support the material.

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CHAPTER 2

SET-UP, ASSEMBLY, DISASSEMBLY, STORAGE, AND SHIPMENT

2-1 PREPARATION FOR USE

2-1.1 Personnel. Ensure a minimum of 20 personnel are available to safely assemble the CP EMEDS +25 system. Tools and equipment for performing this operation are contained in the applicable documents referenced in Tables 4 and 5. Necessary equipment that is part of the EMEDS +25, i.e. ladders, will also be used.
2-1.2 Site Selection. When choosing a site ensure the ground is smooth, well drained, and relatively free of surface rock. Drainage must be adequate to prevent liquid contaminants, water, and prevailing winds from entering the CP EMEDS. Trenching around the hospital may be required to ensure adequate drainage. Preventive Medicine (Public Health) input may be necessary for site selection.

2-1.3 Equipment Needed. The CP EMEDS +25 is designed to be an addition to the EMEDS +25 package. Refer to Table 4 to identify components necessary to collectively protect the EMEDS +25.

2-2 ASSEMBLY

2-2.1 AKMSS Set-Up Changes

Prior to installation of the CB liners, certain set-up procedures of the AKMSS are changed.

NOTE

Shelter frame alignment must be accomplished per the Small Shelter manual. Not adhering to the four inch spacing between frames prevents the subfloor from being attached with the hook and pile allowing water to flow under the CB liners.

CAUTION

Shelter covering MUST be tied snugly to frame. Failure to do so will cause the CB liner to bulge out.

1. The vertical uprights need to be erected with the top nut bolt facing outward to the shelter maincover. This will prevent damage to the CB liners once the system is pressurized.

2. All stakes must be used on all parts of the shelter frame. This will prevent the system from dislodging once pressurized.

3. The EMEDS partition will not be installed. The CP EMEDS is equipped with modular partitions.

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4. A CP EMEDS modified endwall needs to be installed on the emergency room and the ward/dental shelter. Installation procedures will be the same as the EMEDS endwall.

5. A CP EMEDS modified vestibule door needs to be installed on the outer end of the 8’ extension next to the supply and ward shelter. Installation procedures will be the same as the EMEDS vestibule door.

6. The thermal reflective liners will be installed between the frame and shelter maincover.

7. Vent caps on the ends of the shelter will not be installed and the flaps closed.

8. The plenum will not extend through the 8’ extension. Only the end plenum and 32’ shelter plenum will be used.

9. The EMEDS 8’ extension frames have small uprights on either side of the door openings to the 32’ shelter. These should be covered with caps or other protective material to ensure the CB liner is not torn once the system is pressurized.

NOTE

There should be a conscious effort not to track rocks and dirt into the shelter during system set up. Before the flooring sections are installed, the liner material is exposed and vulnerable to the potential sharp debris carried in and out by personnel. There should be a constant emphasis to maintain liner integrity. Tears and holes in the liner material are not acceptable and should be mended promptly. Personnel should take the time to remove excess debris from their boots and uniforms to maintain an environment that effectively protects against chemical/biological agents.

CAUTION

Handle the CB liners carefully making sure not to drag the liners and ***do not pull on the strap attachments***. The straps could be pulled off if used as handles causing potential liner degradation.

CAUTION

When the CB liner material is exposed to long-term industrial chemicals such as gasoline, JP-8 engine oil, hydraulic fluid, ammonia and paint thinner, it is vulnerable to stress cracking and plasticization. Although long-term exposure is not likely, if it should occur take appropriate action to clean up immediately.

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CAUTION

Handle the CB liners carefully making sure not to drag the liners and ***do not pull on the strap attachments***. The straps could be pulled off if used as handles causing potential liner degradation.

CAUTION

When the CB liner material is exposed to long-term industrial chemicals such as gasoline, JP-8 engine oil, hydraulic fluid, ammonia and paint thinner, it is vulnerable to stress cracking and plasticization. Although long-term exposure is not likely, if it should occur take appropriate action to clean up immediately.

2-2.2 Installation of Chemical/Biological (CB) Liners

The liners are installed into the Alaska Medical Shelter System (AKMSS) after the shelters have been fully erected, but before installation of any interior items, i.e. thermal reflective liner, plenums, lights, electrical boxes, etc. The following is the recommended sequence for installing the CB liners. Installation of the CB liners may be done simultaneously in all shelters.

WARNING

Extreme heat can build up between the shelter maincover and thermal reflective liner. Gloves should be worn and caution used when placing hands in the area as burns could occur.

2-2.2.1 Installing 32' CB Liner

1. Connect the AKMSS thermal reflective liners to the shelter by installing it between the frame and shelter maincover. Frame must be visible to attach CB liners. Connect the thermal protective liner by the hook and pile straps, **do not** connect the continuous hook and pile to the next liner.

2. Layout the 32' CB liner section inside the shelter so that the ridge straps are closely in line with the centerline, or ridge purlins, of the shelter and the door membrane openings correspond with the openings of the shelter. The ridge straps on the liner are white straps with "D" rings attached. All other outer straps will be black with an arrowhead design. They will either be unmarked, marked with a 3" round red ink mark for use with the AKMSS, or a 3" round black ink mark for use with the TEMPER.

3. Using a ladder, connect the ridge straps of the CB liner to the ridge purlin of the shelter by threading them over the frame, through the "D" ring and connecting the hook and pile. Ensure the hook and pile is connected evenly (no overlap) allowing the white straps to hang loosely from the ridge purlin. There will be three white straps at each end of the CB liner; one attaches to the ridge purlin and the other two attach to the vertical uprights. Have one or two personnel on the ground lifting the CB liner, easing the tension as the straps are attached.

4. Starting at one end of the shelter connect the black arrowhead straps to the upper arches between the ridge and side purlins. Only attach two of the black straps to allow the ladder to be placed without putting stress on the CB liners. TIP: Pulling up on the liner, slide the black strap across the top of the arch, grasp the end of it and pull

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WARNING

Extreme heat can build up between the shelter maincover and thermal reflective liner. Gloves should be worn and caution used when placing hands in the area as burns could occur.

2-2.2.1 Installing 32' CB Liner

1. Connect the AKMSS thermal reflective liners to the shelter by installing it between the frame and shelter maincover. Frame must be visible to attach CB liners. Connect the thermal protective liner by the hook and pile straps, **do not** connect the continuous hook and pile to the next liner.

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on the strap to fasten. Use personnel on the ground to lift as the person on the ladder attaches the straps. Use only the unmarked straps and straps with a 3" round red ink mark. As you are connecting the straps gently manipulate the liner so it conforms to the AKMSS. Improper placement of the straps can result in stress being applied to the straps. Further damage may result when the system is pressurized. Generally if there is tension on the black strap it is probably in the wrong location

5. Connect the black straps to the rest of the arch, the side purlins and down the bottom of the arch. To prevent stress from being applied to the CB liner and straps, start on one end and work your way to the other end.

6. Connect the continuous hook and pile of the AKMSS thermal reflective liner after the black straps are connected to the frame. This can be done in conjunction with the attachment of the black straps.

7. Once the FDECU ducts have been installed, connect the corner and end black straps and accomplish step 8.

8. To connect the CB liners to the ends of the shelter, release the hook and pile of the AKMSS insulated end wall on the vertical uprights. The black straps can now be attached and the hook and pile reattached.
9. Once all straps have been installed, smooth out the CB liner starting from the inside at the center working outwards towards the sides and the ends of the shelter. The CB liner will be loose, but try and make it as smooth as possible by unfolding and dispersing any crimps, buckling or overlaps.

10. Lay out the TEMPER insulated floor. A 32' AKMSS will take four 8' x 20' TEMPER insulated flooring pieces.

2 Installing 8' Extension CB Liner

1. Connect AKMSS thermal reflective liners to the 8' extension by installing it between the frame and shelter maincover. Frame must be visible to attach CB liners. Connect the thermal reflective liner by the hook and pile straps.

2. Layout the 8' extension CB liner with four way openings in line with openings of 8' shelter extension.

3. Attach black straps to frame starting at the ridge. Starting at one end attach the straps to the top of the end arch, to the side purlin and then along the side arch to the other end. Attach the straps to the other side and end arch and then down the end arch to the ground. Smooth out the liner from inside towards all four sides and lay out TEMPER insulated flooring. Each 8' extension takes one 8' x 20'

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and pull on the strap to fasten. Use personnel on the ground to lift as the person on the ladder attaches the straps. Use only the unmarked straps and straps with a 3" round red ink mark. As you are connecting the straps gently manipulate the liner so it conforms to the AKMSS. Improper placement of the straps can result in stress being applied to the straps. Further damage may result when the system is pressurized. Generally if there is tension on the black strap it is probably in the wrong location

5. Connect the black straps to the rest of the arch, the side purlins and down the bottom of the arch. To prevent stress from being applied to the CB liner and straps, start on one end and work your way to the other end.

6. Connect the continuous hook and pile of the AKMSS thermal reflective liner after the black straps are connected to the frame. This can be done in conjunction with the attachment of the black straps.

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10. Lay out the TEMPER insulated floor. A 32' AKMSS will take four 8' x 20' TEMPER insulated flooring pieces.

2 Installing 8' Extension CB Liner

1. Connect AKMSS thermal reflective liners to the 8' extension by installing it between the frame and shelter maincover. Frame must be visible to attach CB liners. Connect the thermal reflective liner by the hook and pile straps.

2. Layout the 8' extension CB liner with four way openings in line with openings of 8' shelter extension.

3. Attach black straps to frame starting at the ridge. Starting at one end attach the straps to the top of the end arch, to the side purlin and then along the side arch to the other end. Attach the straps to the other side and end arch and then down the end arch to the ground. Smooth out the liner from inside towards all four sides and lay out TEMPER insulated flooring. Each 8' extension takes

TEMPER insulated floor.

2-2.2.3 Installing Vestibule CB Liner

1. Connect AKMSS thermal reflective liners to the vestibule by installing it between the frame and shelter maincover. Frame must be visible to attach CB liners. Connect the thermal reflective liner by the hook and pile straps.

2. Layout the vestibule CB liner with openings facing the 8’ extension. One side of the liner has a double flange the other a single flange. Either side can face in any direction.

3. Attach black straps to frame starting at the center, working your way down the sides. Attach the continuous hook and pile of the AKMSS thermal protective liner as you go.

4. Smooth out the liner towards all four sides from the inside and lay out TEMPER insulated flooring. Each vestibule takes one TEMPER vestibule insulated floor, folded to fit.

4 Installing Internal Partition

When the CB liners are used the internal wall partition normally intended for the EMEDS system cannot be used. To provide this capability, a CB modified partition must be used in the OR shelter.

1. Install the metal poles through the sleeves along the side and top of the partition.

2. Connect the partition to the CB liner by attaching the partition straps to the white straps on the CB liner. There will be straps on both sides of the partition that must be attached.

3. Attach the hook and pile at the bottom of the partition to the hook and pile of the TEMPER insulated floor.

4. The plenum will be routed through the duct opening, the light cord between the partition and CB liner, and the return duct through bottom duct opening.

one 8’ x 20’ TEMPER insulated floor.

2-2.2.3 Installing Vestibule CB Liner

1. Connect AKMSS thermal reflective liners to the vestibule by installing it between the frame and shelter maincover. Frame must be visible to attach CB liners. Connect the thermal reflective liner by the hook and pile straps.

2. Layout the vestibule CB liner with openings facing the 8’ extension. One side of the liner has a double flange the other a single flange. Either side can face in any direction.

3. Attach black straps to frame starting at the center, working your way down the sides. Attach the continuous hook and pile of the AKMSS thermal protective liner as you go.

4. Smooth out the liner towards all four sides from the inside and lay out TEMPER insulated flooring. Each vestibule takes one TEMPER vestibule insulated floor, folded to fit.

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When the CB liners are used the internal wall partition normally intended for the EMEDS system cannot be used. To provide this capability, a CB modified partition must be used in the OR shelter.

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3. Attach the hook and pile at the bottom of the partition to the hook and pile of the TEMPER insulated floor.

4. The plenum will be routed through the duct opening, the light cord between the partition and CB liner, and the return duct through bottom duct opening.

2-2.2 Connecting CB Liners

The 8’ extension, vestibule, and 32’ CB liners are all connected via a two-track flange using a two-track slider also called a zipper. Sliders are provided with each membrane and are totally interchangeable. If one is missing, use one from another location. It is easiest to zip the liners together using two people, one to align the tracks and the second to pull the slider along the seam. A smooth seam interface is necessary to reduce leakage. Gaps, uneven interfaces and partial connections are unacceptable. Excess pressure on the flange may cause disconnects or gaps. Balancing oneself on the liner while zipping may pull the seams apart. Use a different slider if a slider digs into the liner material. A solution of light detergent and water or plain water can be smeared or sprayed sparingly on the track to help lubricate seams. Assure the two-track flange is free of dirt and debris before attempting to zip together.

1. Remove the membrane from the opening to be connected.

2. Starting at the opening of the liner, insert the ends of the two-track flange into the slider openings.

3. Pull each slider completely around the liner opening.

4. If while zipping, you realize that a separation (bubble) of the two-tracks has occurred, you do not necessarily need to disassemble and start over. Depending on the location of the bubble, you can either:

   (1) Slide the zipper fastener back past the location of the bubble and re-zip ensuring the bubble has been closed or

   (2) Continue zipping to the end, remove the slider and start over at the beginning retracing what you have already zipped.

5. Upon completion of zipping, verify seam for closure.

6. Remove slider fasteners and store in readily accessible area. If it is difficult to remove the sliders, they may be left in place.

7. Secure gaps at two-track flange slider openings with chemical protective adhesive patches or chemical protective tape and reinforce with pressure sensitive (duct) tape as required. Apply patch or tape directly over openings as it is critical that all openings be covered. Silicone may be present from the manufacturing process that prevents the tape from adhering. If tape will

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2. Starting at the opening of the liner, insert the ends of the two-track flange into the slider openings.

3. Pull each slider completely around the liner opening.

4. If while zipping, you realize that a separation (bubble) of the two-tracks has occurred, you do not necessarily need to disassemble and start over. Depending on the location of the bubble, you can either:

   (3) Slide the zipper fastener back past the location of the bubble and re-zip ensuring the bubble has been closed or

   (4) Continue zipping to the end, remove the slider and start over at the beginning retracing what you have already zipped.

5. Upon completion of zipping, verify seam for closure.

6. Remove slider fasteners and store in readily accessible area. If it is difficult to remove the sliders, they may be left in place.

7. Secure gaps at two-track flange slider openings with chemical protective adhesive patches or chemical protective tape and reinforce with pressure sensitive (duct) tape as required. Apply patch or tape directly over openings as it is critical that all openings be covered. Silicone may be present from the manufacturing process that prevents the tape from

not adhere, clean the tracks with isopropyl alcohol and reapply.

8. The 8’ extension liner and one side of the vestibule liner are equipped with a double flange. This allows a membrane to be attached to seal off a contaminated area. When zipping the double flange ensure the outer most track is used so that a membrane can be subsequently added. If the inner track were used it would conceal the other track making it unusable.

2-2.4 Installing Plenums, Lights and Electrical Cables

The CB liners are equipped with white loop straps throughout the interior. These allow the connection of plenums, lights and electrical cables to the liners. Do not mishandle the straps; do not pull on them excessively. Doing so could pull the straps out causing loss of integrity in the system. If a strap is pulled from the CB liner leaving a hole, make sure the hole is patched using chemical protective tape.

2-2.4.1 Installation of Plenums

NOTE

Since the CB liners are compatible with both TEMPER and AKMSS, they are equipped with environmental control duct sleeves on both sides of the doors on both ends. Ensure you attach the 45-degree plenum to the correct side. Refer to Figure 43 for proper placement or contact appropriate personnel.

1. Remove straight section plenum from packaging and lay out on the shelter floor parallel with the ridgeline. The extension plenum for the 8’ extension shelter will not be used.

2. Attach 45-degree angle plenum to the end of straight plenum using hook and pile fasteners.

3. Attach plenums to liners along the shelter center ridge using the straps on the plenums and the straps on the liners.

4. Attach the 45-degree angle section to the straps along the end of the liner. Ensure enough room is given to attach the plenum to the supply air duct of the environmental control unit.

adhering. If tape will not adhere, clean the tracks with isopropyl alcohol and reapply.

8. The 8’ extension liner and one side of the vestibule liner are equipped with a double flange. This allows a membrane to be attached to seal off a contaminated area. When zipping the double flange ensure the outer most track is used so that a membrane can be subsequently added. If the inner track were used it would conceal the other track making it unusable.

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3. Attach plenums to liners along the shelter center ridge using the straps on the plenums and the straps on the liners.

4. Attach the 45-degree angle section to the straps along the end of the liner. Ensure enough room is given to attach the plenum to the supply air duct of the environmental control unit.

NOTE
Ensure the plenums are routed through the top opening of the internal partition in the OR and the butyl recirculation duct is routed through the bottom opening.

2-2.4.2 Installation of Lights and Electrical Cables

NOTE

The Bruce lights may be hung from either the sides of the shelter or the ceiling. Both ways are described below. If hung from ceili ld be hung LOW during initial installation to prevent disconnection during pressurization of the shelter. They may later be raised to a comfortable working height.

1. From Ceiling - Attach the Bruce lights adjacent to the plenum using the white straps on the ceiling interior of the liner, between the sides and the ridge. Loop the end of the Bruce light straps through the white straps corresponding with the arch frame.

2. From Sides - Attach the lights along the sides using hook and pile straps. These will be hung adjacent to the side purlins.

3. Attach the light box pole to the end of the shelter where the doorframe is located. Straps are located on the liner to secure the light box pole to the CB liner. Partially inserting the light box pole into the light box pocket at the top will help in stabilizing the pole.

4. Attach electrical cables to the liner using the white straps alongside the shelter. The white straps will have a loop and two straps. To avoid disconnecting the cables during pressurization, attach the cable using the straps rather than threading the cable through the loop. Tie the electrical cable loosely when attaching, this will allow some give during initial pressurization. (Photo shows electrical cable with power outlets at the top. This is only one way it may be done. The electrical cable may also be routed through the top with the power outlets hanging down).

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NOTE
Ensure the plenums are routed through the top opening of the internal partition in the OR and the butyl recirculation duct is routed through the bottom opening.

2-2.4.2 Installation of Lights and Electrical Cables

NOTE

Both ways are described below. If hung from ceiling, lights should be hung LOW during initial installation to prevent disconnection during pressurization of the shelter. They may later be raised to a comfortable working height.

1. From Ceiling - Attach the Bruce lights adjacent to the plenum using the white straps on the ceiling interior of the liner, between the sides and the ridge. Loop the end of the Bruce light straps through the white straps corresponding with the arch frame.

2. From Sides - Attach the lights along the sides using hook and pile straps. These will be hung adjacent to the side purlins.

3. Attach the light box pole to the end of the shelter where the doorframe is located. Straps are located on the liner to secure the light box pole to the CB liner. Partially inserting the light box pole into the light box pocket at the top will help in stabilizing the pole.

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2-2.5 Installing and Positioning Recirculation Filter Assembly Units

NOTE
Place recirculation filter assembly units close to airlocks where they will not interfere with personnel movement or restrict airflow.

1. Refer to Figure 43 for proper location of recirculation filter units. Locations are identified by this symbol: 
2. If one is not installed, install a recirculation filter element into the recirculation filter assembly unit.
3. Check that the power switch is in the off (down) position. Connect the 110V power cord to the electrical system of the shelter.

2-2.6 Installation of Low Pressure Alarm

CAUTION

This equipment is very sensitive. DO NOT DROP.

1. Refer to Figure 43 for placement of the low-pressure alarms. Locations are identified by this symbol: 
2. If the low-pressure alarms are to be mounted on the light boxes, attach the system to the mounting bracket. There are four thumb screw assemblies on the backside of the bracket. Align the low-pressure alarm screw receptacles with the screw holes and fasten the four screws.
3. Mount the low-pressure alarm to the electrical distribution box. The two legs of the mounting bracket slide in between the handles on the distribution box. Hand tighten the quarter turn adjustable latches.
4. Where no light box is available the low-pressure alarm may be set upon a recirculation filter assembly or table. (See Figure 37.)
5. Secure one end of the tubing to the low side port of low-pressure alarm. To ensure accurate pressure readings, the tubing must not be crimped. Rout the other end of the tubing through the electrical port of the CB liner and out of the shelter. Make sure the tubing is not obstructed or laying on the ground.

2-2.5 Installing and Positioning Recirculation Filter Assembly Units

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5. Secure one end of the tubing to the low side port of low-pressure alarm. To ensure accurate pressure readings, the tubing must not be crimped. Rout the other end of the tubing through the electrical port of the CB liner and out of the shelter. Make sure the tubing is not obstructed or laying on the ground.

6. Plug the 110V cord into the electrical system of the shelter.

2-2.7 Installation of Potable Water Distribution System

This section reserved for installation procedures within CP EMEDS +25.

2-2.8 Installation of Airlocks

2-2.8.1 Installing Bump-Through-Door (BTD) Airlock

Refer to Figure 43 for placement of the BTD airlock. Complete set-up instructions are found in Appendix B of this manual. Becket and lace the TEMPER vestibule of the BTD airlock to either the modified AKMSS endwall or the modified AKMSS vestibule door. These modifications allow the TEMPER to interface with the AKMSS.

2-2.8.2 Installing Protective Entrance (PE) Airlock with Adapter and Light Connector.

NOTE
PE airlocks are always installed under TEMPER vestibules. Due to space limitations, it is recommended that all equipment required be inside the shelter prior to installing the PE airlock.

1. Refer to Figure 43 for correct placement of PE airlocks.

2. Connect PE airlock adapter to shelter liner by removing the membrane and zipping the PE airlock adapter into the opening. Use the same zipping technique as described in section 2-2.3 of this manual. Prior to zipping in the PE airlock adapter, ensure that the adapter is positioned so that the stenciled markings are toward the outside.

3. Position the PE airlock near where it is to be used.

4. Refer to Army TM 10-8340-224-13 on instructions on erecting the TEMPER vestibule. Becket and lace the TEMPER vestibule to either the modified AKMSS end wall or the modified AKMSS extension. These modifications allow the TEMPER to connect with the AKMSS.

5. Refer to Army TM 3-4240-338-12&P for detailed installation procedures and illustrations of the PE airlock.

6. The PE airlock is installed from the inside by attaching the hook and pile fasteners. Ensure there is a good seal, any excess material should be routed under one of the four corners where there is double hook and pile and PE

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6. Plug the 110V cord into the electrical system of the shelter.

2-2.7 Installation of Potable Water Distribution System

This section reserved for installation procedures within CP EMEDS +25.

2-2.8 Installation of Airlocks

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NOTE
PE airlocks are always installed under TEMPER vestibules. Due to space limitations, it is recommended that all equipment required be inside the shelter prior to installing the PE airlock.

1 Refer to Figure 43 for correct placement of PE airlocks.

2 Connect PE airlock adapter to shelter liner by removing the membrane and zipping the PE airlock adapter into the opening. Use the same zipping technique as described in section 2-2.3 of this manual. Prior to zipping in the PE airlock adapter, ensure that the adapter is positioned so that the stenciled markings are toward the outside.

3 Position the PE airlock near where it is to be used.

4 Refer to Army TM 10-8340-224-13 on instructions on erecting the TEMPER vestibule. Becket and lace the TEMPER vestibule to either the modified AKMSS end wall or the modified AKMSS extension. These modifications allow the TEMPER to connect with the AKMSS.

5 Refer to Army TM 3-4240-338-12&P for detailed installation procedures and illustrations of the PE airlock.

6. The PE airlock is installed from the inside by attaching the hook and pile fasteners. Ensure there is a good seal, any excess material should be

airlock material.

7. The bottom outer edges of the PE airlock should be staked to provide stability. It is recommend that this staking is done after pressurization, as the PE airlock may need to be adjusted for stability.

8. Feed the PE airlock power supply cord through the PE airlock sleeve into the interior of the CP EMEDS. Connect the PE airlock light adapter cord to the power cord and plug into the electrical distribution box.

2-2.9 Installation of Field Deployable Environmental Control Unit (FDECU) with NBC Hardening Kit

1. Refer to Figure 43 for proper placement of FDECUs. Position the FDECU on a level surface, with the supply and return duct opening opposite the opposing shelter duct openings, approximately six1/2 feet away from the shelter at a slight 15-20 degree angle.

2. Refer to Army TM 9-4120-411-14 for detailed instructions on setup and installation of the FDECU NBC hardening kit. The return air flange assembly is not used in NBC mode. This flange may be installed on the return air duct inside the shelter. Remove the filter screen prior to installing and store inside the FDECU.

3. If using the M28 CPE motor blower support kits and HSFCs, refer to Army TM 3-420-338-12&P for detailed instructions on setup and installation.

CAUTION

Particular attention needs to be adhered to when dealing with the three-phase wiring of the FFA 580-100 fan filter assembly units. The white wire is ground versus the green wire. Failure to ground the equipment correctly could result in equipment failure.

routed under one of the four corners where there is double hook and pile and PE airlock material.

7. The bottom outer edges of the PE airlock should be staked to provide stability. It is recommend that this staking is done after pressurization, as the PE airlock may need to be adjusted for stability.

8. Feed the PE airlock power supply cord through the PE airlock sleeve into the interior of the CP EMEDS. Connect the PE airlock light adapter cord to the power cord and plug into the electrical distribution box.

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3. If using the M28 CPE motor blower support kits and HSFCs, refer to Army TM 3-420-338-12&P for detailed instructions on setup and installation.

CAUTION

Particular attention needs to be adhered to when dealing with the three-phase wiring of the FFA 580-100 fan filter assembly units. The white wire is ground versus the green wire. Failure to ground the equipment correctly could result in equipment failure.

4. Install the modified FFA-580 400-cfm blower by locating the unit in close proximity of the FDECU. Allow enough distance to connect the two 6 inch ducts. These ducts are connected from the blower unit air supply and attach to the two mating ports located on the FDECU return air NBC adapter ring. Power is applied using the modified Y cord and connects to two of the convenience outlets located on the FDECU. Insure two M6 style filters are installed in the unit prior to operation.

2-2.10 Installation of Emergency Equipment

1. Install CB liner membranes in the immediate area of the 8' extension openings. These will be used to seal off a shelter if contamination occurs. Ensure all personnel know the locations.

2. Install knives at every potential door opening and dispersed throughout the shelter. These may be tied to the side purlin white straps. The knives will be used to cut through the CB liner and shelter in case of emergency. Ensure all personnel know the locations.

3. Fire extinguishers should be placed at known locations throughout the shelter.

2-3 CP EMEDS +25 LAYOUT

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2-4 DISASSEMBLY AND PREPARATION FOR STORAGE

The following procedures apply to a CP EMEDS +25 that has not been contaminated. Refer to FM 3-5, NBC Contamination, FM 3-4, NBC Protection, and on site commander for guidance on decontaminating and proper disposal of equipment.

Disassembly is accomplished in reverse order of installation.

WARNING

Operating personnel must think safety at all times. Do not replace components or make adjustments inside equipment with the electrical supply turned on. Under certain conditions, danger may exist even when the power control is in the off position due to charges retained by capacitors. To avoid injuries, always remove power, discharge and ground a circuit before touching it. Adhere to lock-out/tag-out procedures.

1. Refer to Army TM 9-4120-411-14 for detailed instructions on disassembly and storage of NBC Hardened FDECUs.

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4. Install the modified FFA-580 400-cfm blower by locating the unit in close proximity of the FDECU. Allow enough distance to connect the two 6 inch ducts. These ducts are connected from the blower unit air supply and attach to the two mating ports located on the FDECU return air NBC adapter ring. Power is applied using the modified Y cord and connects to two of the convenience outlets located on the FDECU. Insure two M6 style filters are installed in the unit prior to operation.

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1. Refer to Army TM 9-4120-411-14 for detailed instructions on disassembly and storage of NBC Hardened FDECUs.

2. Refer to Army TM 3-4240-338-12&P for detailed instructions on disassembly and storage of motor blowers.

3. **Reserved for disassembly and storage of FFA580- 400cfm blower.**

4. Turn in uncontaminated, damaged, used, or unusable filters to your hazardous waste management office or Defense Reutilization and Marketing Office (DRMO). Do not throw away as ordinary trash.

5. Refer to Appendix B of this manual for disassembly and storage preparation of BTD airlock.

6. Refer to Army TM 10-8340-224-13 for detailed instructions on disassembly and storage of TEMPER vestibule.

7. Refer to Army TM 3-4240-338-12&P for detailed instructions on disassembly and storage of PE airlock. Remove PE airlock adapter from position and package. To unzip, remove tape and gently pull at opening. Flanges will start to disengage and can be gently pulled apart. The system can also be unzipped by pulling the slider around in the opposite direction.

8. Unplug and remove recirculation filter assembly units.

9. Unplug the low-pressure alarm. Remove the low pressure tubing from the electrical duct opening. With both the electrical cord and tubing inside, close the cover and fasten the two captive screws. If the low-pressure alarm is attached to a mounting bracket, it is not necessary to remove the system from the bracket.

10. Remove all lights, light boxes, plenums, and electrical connections from CB liner white interior straps. Ensure items are untied and not pulled off.

11. Disconnect, fold and store the internal partition.

12. Remove all tape from openings and disconnect all sections of CB liners from each other, i.e. 8’ extension from vestibules and 32’ liner. This can be done in two ways. If the slider is still attached, unzip by going in the opposite direction. If the slider is not attached gently pull at opening of two-track flanges. Flanges will start to disengage and can be gently pulled apart.

13. Once all items and equipment have been removed from the interior of the shelter, remove the TEMPER insulated flooring. Set some of this flooring aside to be used as a base to fold the CB liners.

14. When disconnecting CB liners, **do not pull** on the straps. Starting at the sides of the vestibule CB liner and working your way to the top undo all the black straps. The hook and pile of the AKMSS thermal reflective liner will be undone in conjunction with the straps.

2. Refer to Army TM 3-4240-338-12&P for detailed instructions on disassembly and storage of motor blowers.

3. **Reserved for disassembly and storage of FFA580- 400cfm blower.**

4. Turn in uncontaminated, damaged, used, or unusable filters to your hazardous waste management office or Defense Reutilization and Marketing Office (DRMO). Do not throw away as ordinary trash.

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15. Starting at the sides of the 8’ extension CB liner and working your way to the top, undo all the black straps. **Do not pull** on the straps. The hook and pile of the AKMSS thermal reflective liner will be undone in conjunction with the black straps.

16. Starting at the sides and ends of the 32’ CB liner and working your way to the ridge undo all the straps. **Do not pull** on the straps. Use of a ladder is essential. The hook and pile of the AKMSS thermal reflective liner will be undone in conjunction with the black straps.

17. Carry the CB liners to a packing location. **Do not drag**. Dragging, particularly over rough surfaces could ruin the liners. If there is room, they may be folded inside the shelter or taken to an area where the TEMPER insulated flooring has been laid out. Ensure CB liners are dry and clean prior to folding and storing.
18. Identify and label any damaged material. If possible repair damage on site. If damage is significant, make liner unserviceable and report item to appropriate personnel.

19. Fold the CB liners to ensure they fit into the appropriate butyl bag. The bag should close securely once the CB liner is inside. The following are recommended folding techniques:

    a. 32’ CB liner – Straighten the liner out, squaring it off as much as possible on the ends, with the ridge straps centered. Position the door openings (with or without membrane) to lie on the upper side of the liner. Starting at the long sides, fold the liner in approximately 15” increments. Once the sides meet at the ridge, take one side and fold it over the other. Starting at one end, fold the liner in approximately two feet increments, repeating till the end. Place into the butyl bag.

    b. 8’ extension CB liner - Straighten the liner out, squaring it off as much as possible on the ends, with the ridge straps centered. Starting at the long sides, fold the liner in approximately 15” increments. Once the sides meet at the ridge, take one side and fold it over the other. Starting at one end, fold the liner in approximately two feet increments, repeating till the end. Place into the butyl bag.

    c. Vestibule liner - Fold in half length wise, then half again. Fold in half from the middle and then half again. Place into butyl bag.

20. Ensure sliders are evenly distributed throughout butyl carry bags.

2-5 STORAGE AND PREPARATION FOR SHIPMENT

2-5.1 Packing of all components into storage areas should be done in accordance with local Standard Operating Procedures (SOP).

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15. Starting at the sides of the 8’ extension CB liner and working your way to the top, undo all the black straps. **Do not pull** on the straps. The hook and pile of the AKMSS thermal reflective liner will be undone in conjunction with the black straps.

16. Starting at the sides and ends of the 32’ CB liner and working your way to the ridge undo all the straps. **Do not pull** on the straps. Use of a ladder is essential. The hook and pile of the AKMSS thermal reflective liner will be undone in conjunction with the black straps.

17. Carry the CB liners to a packing location. **Do not drag**. Dragging, particularly over rough surfaces could ruin the liners. If there is room, they may be folded inside the shelter or taken to an area where the TEMPER insulated flooring has been laid out. Ensure CB liners are dry and clean prior to folding and storing.
18. Identify and label any damaged material. If possible repair damage on site. If damage is significant, make liner unserviceable and report item to appropriate personnel.

19. Fold the CB liners to ensure they fit into the appropriate butyl bag. The bag should close securely once the CB liner is inside. The following are recommended folding techniques:

    a. 32’ CB liner – Straighten the liner out, squaring it off as much as possible on the ends, with the ridge straps centered. Position the door openings (with or without membrane) to lie on the upper side of the liner. Starting at the long sides, fold the liner in approximately 15” increments. Once the sides meet at the ridge, take one side and fold it over the other. Starting at one end, fold the liner in approximately two feet increments, repeating till the end. Place into the butyl bag.

    b. 8’ extension CB liner - Straighten the liner out, squaring it off as much as possible on the ends, with the ridge straps centered. Starting at the long sides, fold the liner in approximately 15” increments. Once the sides meet at the ridge, take one side and fold it over the other. Starting at one end, fold the liner in approximately two feet increments, repeating till the end. Place into the butyl bag.

    c. Vestibule liner - Fold in half length wise, then half again. Fold in half from the middle and then half again. Place into butyl bag.

20. Ensure sliders are evenly distributed throughout butyl carry bags.

2-5 STORAGE AND PREPARATION FOR SHIPMENT

2-5.1 Packing of all components into storage areas should be done in accordance with local Standard Operating Procedures (SOP).

2-5.2 NBC filters should not be exposed to high humidity during storage.

2-5.3 Do not expose CB liners to high UV. Do not store where temperatures exceed +145 degrees Fahrenheit.

2-6 STORAGE INSPECTION CRITERIA

2-6.1 Refer to Army TM 9-4120-411-14 for complete inspection criteria of the FDECU. Routine preventive maintenance procedures will also be cited.

2-6.2 Refer to Army TM 3-420-338-12&P for complete storage and inspection criteria of all M28 Collective Protection Equipment.

2-6.3 CB liners will require inspection after 60 months from date of manufacture if the storage mode is undisturbed. Since this equipment has a shelf life code of 60 months extendable, this requires inspection of the liners for signs of damage due to aging, (e.g. yellowing), cracking, seam separation or delamination at the 60-month term. It the equipment is determined to be serviceable, re-inspect the equipment annually until removed from service.

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2-5.3 Do not expose CB liners to high UV. Do not store where temperatures exceed +145 degrees Fahrenheit.

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CHAPTER 3

OPERATING INSTRUCTIONS

WARNING

All personnel should be briefed on pressurized operations and inspections. Information must be provided so they are aware of proper ingress and egress through all airlocks and what to do in case of fire or contamination.

3-1 EQUIPMENT INSPECTION

The following inspections are to be accomplished prior to system pressurization.

3-1.1 Shelter

CAUTION

During pressurization, damaged AKMSS or TEMPER may not be able to support the CB liners, causing it to bulge out and rip.

1. Inspect both the AKKMSS and TEMPER components for tears or broken sliders and replace or fix as necessary.
2. Ensure all shelter doors are zipped prior to pressurization. After pressurization it will not be possible to close.
3. Ensure all shelter windows are closed and not rolled up exposing the CB liners to sunlight. CB liners should not be exposed to sunlight for prolonged periods, as they will degrade.
4. Ensure all electrical and ECU duct sleeves not in use are closed and tied off.
5. Ensure lights are hanging in the low position, all electrical lines are connected, emergency knives are dispersed throughout, and plenums are installed properly both to the CB liners and supply air ducts of FDECUs.
6. Inspect OR internal partition to ensure proper installation. Supply plenum should be routed through opening in top and butyl return duct should be routed through opening in bottom.

3-1.2 CB Liners

1. Inspect the CB liners for proper installation. Ensure straps are attached to proper part of AKMSS frame. No tension should be noted at areas attached. Liners should be hanging loose.

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CHAPTER 3

OPERATING INSTRUCTIONS

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6. Inspect OR internal partition to ensure proper installation. Supply plenum should be routed through opening in top and butyl return duct should be routed through opening in bottom.

3-1.2 CB Liners

1. Inspect the CB liners for proper installation. Ensure straps are attached to proper part of AKMSS frame. No tension should be noted at areas attached. Liners should be hanging loose.

2. Inspect **all** seams and ensure mating ends are properly sealed. Check all flanges ensuring no bubbles or gaps have occurred. Ensure the two-track of the flange has been mated correctly.
3. Ensure all gaps in the liner interfaces are sealed with chemically protective adhesive patches or tape. Ensure any pressure sensitive tape installed is adhering.

4. Check the end sections of the 32' CB liners for unsecured ties around the electrical cable interface area and environmental control duct interfaces. Tie as necessary around the ducts and electrical cables.

5. Check for any rips or tears and repair as necessary.

6. Ensure extra membranes are located near double-flanged openings of 8' extension CB liners in case part of shelter needs to be isolated.

7. Ensure all equipment on the floor is approximately 18" away from all sides of the shelter. This allows expansion of the CB liner without tension that could tear the CB liner. Equipment may be moved closer to the sides once system has been pressurized.

3-1.3 Airlocks

3-1.3.1 Protective Entrance (PE) Airlock

1. Inspect protective entrance for stability and proper positioning. TEMPER vestibule should be staked and secured with guy wires. Have two stakes available to stake PE airlock once pressurization has stabilized.
2. Inspect hook and pile fastener attachment around entire interface and ensure the corner reinforcements (double-sided hook and pile fastener) are properly connected.

3. Ensure the slits that permit egress/ingress will mate together with a minimum of puckering. Adjusting the base in relation to the shelter will assist in obtaining the correct positioning.

4. Set the magnehelic pressure gauges located inside and outside the PE airlock to zero. While holding gauge in vertical position (it will be hanging low due to absence of pressure), turn the adjusting screw using the attached zero adjusting tool.

5. Check PE airlock timer for proper operation.

2. Inspect **all** seams and ensure mating ends are properly sealed. Check all flanges ensuring no bubbles or gaps have occurred. Ensure the two-track of the flange has been mated correctly.

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3. Ensure the slits that permit egress/ingress will mate together with a minimum of puckering. Adjusting the base in relation to the shelter will assist in obtaining the correct positioning.

4. Set the magnehelic pressure gauges located inside and outside the PE airlock to zero. While holding gauge in vertical position (it will be hanging low due to absence of pressure), turn the adjusting screw using the attached zero adjusting tool.
5. Check PE airlock timer for proper operation.

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6. Halfway open hook and pile fastener vent covers on shelter side of PE airlock and interior of PE airlock.

7. Ensure PE airlock interior light connector is plugged into the light box and duct opening is secured around electrical line.

8. Close and tie off all unused duct openings.

3-1.3.1 Bump-Through-Door (BTD) Airlock

1. Inspect BTD airlock for stability and proper positioning. TEMPER vestibule should be staked and secured with guy wires.

2. Set both magnehelic pressure gauges located at the inner door assembly to zero.

3. Check that all hook and pile connections of both doors are complete.

4. Check CB liner for rips or tears and repair as necessary. Ensure there are no gaps in the two-track connection of the BTD airlock liner to the shelter liner.

5. Check that the filters have been installed in the FFA 580 600 cfm blower. Detailed instructions may be found in Appendix B of this manual.

6. Ensure that all four hose clamp connections of the 12-inch flexible ducts are tight.

3-1.4 NBC Hardened Field Deployable Environmental Control Units

NOTE

Odor of ammonia is common when new HSFC and NBC filters are installed. Odor will soon dissipate and is not harmful to personnel. Motor blowers may be attached to HSFC prior to attaching to FDECUs and operated to the atmosphere prior to initial set-up.

NOTE

Responsible personnel, i.e. BioMedical Equipment Technicians or Civil Engineers should use the detailed operational checklist in Army TM 9-4120-411-14 for the FDECU and Army TM 3-4240-338-12&P for motor blowers and HSFCs.

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6. Halfway open hook and pile fastener vent covers on shelter side of PE airlock and interior of PE airlock.

7. Ensure PE airlock interior light connector is plugged into the light box and duct opening is secured around electrical line.

8. Close and tie off all unused duct openings.

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2. Set both magnehelic pressure gauges located at the inner door assembly to zero.

3. Check that all hook and pile connections of both doors are complete.

4. Check CB liner for rips or tears and repair as necessary. Ensure there are no gaps in the two-track connection of the BTD airlock liner to the shelter liner.

5. Check that the filters have been installed in the FFA 580 600 cfm blower. Detailed instructions may be found in Appendix B of this manual.

6. Ensure that all four hose clamp connections of the 12-inch flexible ducts are tight.

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NOTE

Responsible personnel, i.e. BioMedical Equipment Technicians or Civil Engineers should use the detailed operational checklist in Army TM 9-4120-411-14 for the FDECU and Army TM 3-4240-338-12&P for motor blowers and HSFCs.

1. Ensure the remote control panel has been routed into the shelter and the function switch located on the FDECU unit is switched to the remote position.

2. Ensure all ducts are installed correctly and the supply air duct has been connected to the plenum inside the shelter. Ensure that CB liner duct sleeves and shelter duct sleeves are securely tied around FDECU ducts.

3. Check time totaling meter on motor blower. If near 500 hours, recommend changing out prior to pressurization.

4. Inspect HSFCs to ensure they are not dented, cracked or previously used ("pop-top" seal removed). It is recommended to keep them in their transportation crate for protection. Ensure motor blower ducts are applied correctly with the tension of the HSFC inlet duct pulling on the hard tab instead of the release tab.

5. Ensure power cable has been connected to power source and system is turned on. DO NOT turn on motor blowers at this time.

3-1.5 FFA-580 400 cfm Fan Filter Assembly

1. Inspect blower and ensure two 200 cfm filters have been installed.

2. Ensure system is connected to power source.

3. Ensure the two 6" ducts are attached securely with clamps to the FDECU NBC adapter ring and the FFA 580 outlet adapter.

3-1.6 Recirculation Filter Assembly

1. Ensure filter has been installed.

2. Ensure recirculation filter assembly is in proper location and connected to power source. Turn on and check operation.

3-1.7 Low Pressure Alarm

1. Ensure the low pressure alarm is in proper location and connected to power source.

2. Inspect clear tubing to ensure there are no crimps, it is threaded to the outside and is not lying on the ground.

3. Switch power button on, note LCD readout visible and check to see if audio alarm is working. Audible alarm will continue to sound since system is not pressurized, it may be silenced.

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3-1.5 FFA-580 400 cfm Fan Filter Assembly

1. Inspect blower and ensure two 200 cfm filters have been installed.

2. Ensure system is connected to power source.

3. Ensure the two 6" ducts are attached securely with clamps to the FDECU NBC adapter ring and the FFA 580 outlet adapter.

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1. Ensure filter has been installed.

2. Ensure recirculation filter assembly is in proper location and connected to power source. Turn on and check operation.

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1. Ensure the low pressure alarm is in proper location and connected to power source.

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3-1.8 This section reserved for Potable Water Distribution System

3-1.9 Unique Medical Equipment

1. The water reclaimer system of the sterilizers is part of the EMEDS +25 package. System must be set-up for the CP EMEDS +25. If the system is not installed steam and moisture will build up within the shelter. Caution must be exercised to prevent the CB liner from coming into contact with the autoclave if the system de-pressurizes while the autoclave is functioning.

2. When anesthesia is being used it must be vented to the outside. See section 3-4.1 for proper venting procedures.

3-2 SHELTER INGRESS AND EGRESS

WARNING

There will be limited emergency egress once CB liners are installed. An emergency egress plan with number and location of exits **MUST** be developed for all personnel, to include patients.

WARNING

The CP EMEDS +25 provides chemical protection with materials that are flammable but not readily ignitable. An emergency plan in case of fire **MUST** be developed. This should include exit, fire extinguisher, and emergency knife locations and be available to all personnel, to include patients.

3-2.1 General

1. Prior to entering the toxic free area contaminated personnel will be processed through the decontamination facility and the airlocks IAW ACC Concept of Operation for the Wartime Medical Decontamination and the following procedures. Only airlocks adjacent to the medical decontamination will be used. All others must be blocked.

2. In a non-contaminated atmosphere, any airlock may be used following the procedures below but without the purge times.
3. If a fire breaks out in the shelter and cannot be controlled or extinguished it may be necessary to cut the liner and shelter for emergency exit. In a contaminated environment prior to egressing, ensure all personnel, including patients, are in MOPP 4 gear. A knife may be used to cut the CB liners and shelter material and PE airlocks may be detached from the shelter.

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3-2.2 Protective Entrance (PE) Airlock Procedures

WARNING

In a contaminated environment, ensure decontamination procedures are adhered to IAW ACC Concept of Operation for Wartime Medical Decontamination and FM 3-4, NBC Protection prior to entering the TFA. Failure to do so could allow the penetration of chemical or biological agents.

1. Only one person may enter the PE airlock at a time. Detailed procedures are contained in ARMY TM 3-4240-338-12&P and FM 3-4.

2. Before entering the PE airlock, look through the PE airlock window to ensure it is unoccupied and interval timer is set at zero.

3. Enter the PE airlock and ensure the door is closed with the hook and pile fasteners sealed. Set the interval timer, mounted on the PE airlock inside wall, by turning the knob clockwise to three minutes. This is the time necessary to purge the PE airlock.
4. After the interval timer bell sounds, enter the shelter.

5. In a non-contaminated environment the purge time is not necessary, however, you must still ensure the door you entered is closed prior to entering the shelter.

6. Follow the above procedures minus the purge time when exiting the shelter through the PE airlock.

3-2.3 Bump-Through-Door (BTD) Airlock Procedures

1. Entry and exit procedures may be found in Appendix B of this manual. 12 ambulatory personnel or up to two NATO litters with one attendant and four litter bearers each can process through this airlock. With both doors closed the purge time is three minutes.

2. In a non-contaminated environment the purge time is not necessary, however, you must ensure both doors are closed prior to entering the shelter. It is recommended once entering the BTD airlock and prior to entering the shelter, time is given for the BTD airlock to re-pressurize. This will prevent excessive air leakage from the shelter into the BTD airlock.

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3-3 INITIALIZING POSITIVE PRESSURE

3-3.1 General

The CP EMEDS remains pressurized during all operations to provide chemical/biological protection. It also provides protection from insects, vermin and water seepage. It is designed to operate with an interior pressure of 0.5 - 0.75 iwg, with an optimal pressure of 0.6 iwg. Pressure inside the airlocks should be at 0.3 iwg. Pressure inside the toxic free area (TFA) should not go above 0.75 iwg for a prolonged period of time. The following procedures are for pressurization in a clean environment.

WARNING

All personnel, to include patients, should be briefed and trained on operations within a chemical threat environment. This should include location and proper use of MOPP gear as well as ingress/egress procedures during the presence of chemical/biological agents.

NOTE

Prior to pressurization ensure all checks have been done IAW section 3-1 of this manual.

CAUTION

Periodic monitoring of pressure gauges is required. It is extremely important to regulate the pressure in the CP EMEDS. Too much overpressure places stress on the CB liners and airlocks causing an adverse impact of effectiveness. Inadequate pressure does not allow proper purge times and the possibility of contaminates entering the TFA.

1. Ensure recirculation filter assembly units and low pressure alarms are turned on.

2. Position one person at every airlock and low pressure alarm to monitor pressure during start-up. One person will also need to be inside each PE airlock.

3. Position personnel throughout shelters to watch liners as pressurization occurs. If tearing of the CB liners starts to occur or shelter starts to lift, discontinue pressurization until problem has been fixed.

4. Position a couple of personnel outside the shelter by each PE airlock to adjust the PE airlock as system is pressurizing.

5. Turn on all motor blowers and FFA 580 600 cfm and 400 cfm fan filter assemblies.

6. Wait approximately 5 minutes for system to start pressurizing; monitor the pressure via the magnehelic gauges of the airlocks and low pressure alarm. During this time personnel should not exit or enter the system to

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facilitate pressurization.

7. Adjust the hook and pile vent cover fasteners on the PE airlock and the vent above the inner door of the BTD airlock to achieve a shelter pressure of 0.6 iwg. Uncovering or opening vents will allow more air to escape, lowering the pressure. Covering or closing vents will contain the air increasing pressure. Open or close one vent at time and wait approximately one minute for system to stabilize. It is recommended that the use of radios or runners be used to ensure the pressure is constant in all the shelter units.

8. Adjust hook and pile vent cover fasteners inside PE airlock to obtain 0.3 iwg pressure.

9. Adjust PE airlock as necessary and stake into position. Additional stabilization of the airlock may be obtained by securing it to the shelter frame with a rope through the top handles of the PE airlock.

3-3.2 Adequate Pressure Unachievable

If system won't pressurize the following actions should be taken.

1. Ensure personnel are not exiting or entering the system.

2. Seal up all known air leakage points. This should include the airlocks.

3. Check the CB liners for unknown leakage points. This could include rips or tears in the liner and/or openings between zipped areas. Check to ensure all two-track flanges are sealed, listen for any air leakage (whistling). Take corrective action to repair leakage points and reinforce repaired areas, if necessary.
4. Ensure tape or patches on all slider openings are sealed. Reinforce as necessary.

5. Ensure all electrical and environmental control ducts not in use are tied off.

6. Ensure all electrical and environmental control ducts in use are tied securely around electrical cables and environmental control unit ducts.

7. Ensure all motor blowers and FFA 580 400 cfm blowers are functioning.

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7. Adjust the hook and pile vent cover fasteners on the PE airlock and the vent above the inner door of the BTD airlock to achieve a shelter pressure of 0.6 iwg. Uncovering or opening vents will allow more air to escape, lowering the pressure. Covering or closing vents will contain the air increasing pressure. Open or close one vent at time and wait approximately one minute for system to stabilize. It is recommended that the use of radios or runners be used to ensure the pressure is constant in all the shelter units.

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4. Ensure tape or patches on all slider openings are sealed. Reinforce as necessary.

5. Ensure all electrical and environmental control ducts not in use are tied off.

6. Ensure all electrical and environmental control ducts in use are tied securely around electrical cables and environmental control unit ducts.

7. Ensure all motor blowers and FFA 580 400 cfm blowers are functioning.

3-4 OPERATION IN A THREAT ENVIRONMENT

3-4.1 Anesthesia Equipment

1. The anesthesia equipment is part of the CP EMEDS, but since it interfaces to the outside of the hospital it could be a potential point for chemical or biological penetration.

2. When in operation, the anesthesia equipment will continuously pump air to the outside of the shelter. Failure to operate the exhaust pump continuously during a chemically/biologically active environment may allow penetration of agents.

3. When the anesthesia equipment is not in operation, the hose should be disconnected from the anesthesia valve on the side of the shelter and sealed with chemically protective tape.

3-4.2 Low Pressure Alarm – Alarms Sound

WARNING

The alarms **ARE NOT** chemical and biological detection devices. They are intended to give early warning that the system pressures are becoming unacceptable for chemical and biological protection.

The low pressure alarm monitors the pressure inside the shelter. It contains audible and visual alarms that will be triggered if pressure drops below 0.40 iwg. It can be silenced and will reset itself when the pressure rises above 0.45 iwg. If the pressure rises above 0.85 iwg an alarm will also sound.

Periodic monitoring of pressure gauges is required. It is extremely important to regulate the pressure in the CP EMEDS. Too much overpressure places stress on the CB liners and airlocks causing an adverse impact of effectiveness. Inadequate pressure does not allow proper purge times and the possibility of contaminates entering the TFA.

If chemical and biological protection is required and the alarms sound indicating low pressure, the following actions should be taken:

(1) Ensure personnel are not exiting or entering the system.

(2) Halt processing through airlocks until low-pressure problem has been solved.

(3) Seal up all known air leakage points. This should include the airlocks.

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(4) Check the CB liners for unknown leakage points. This could include rips or tears in the liner and/or openings between zipped areas. Check to ensure all two-track flanges are sealed, listen for any air leakage (whistling). Take corrective action to repair leakage points and reinforce repaired areas, if necessary.

(5) Ensure tape or patches on all slider openings are sealed. Reinforce as necessary.

(6) Ensure all electrical and environmental control ducts not in use are tied off.

(7) Ensure all electrical and environmental control ducts in use are tied securely around electrical cables and environmental control unit ducts.

(8) Ensure all motor blowers and FFA 580 400-cfm fan filter assemblies are functioning.

4. If the alarm sounds due to high pressure, open vents in the airlocks to regulate the pressure to acceptable levels. If necessary, ECU ducts may be opened slightly to bleed off excess pressure.

3-5 EQUIPMENT FAILURE

WARNING

Appropriate MOPP gear **MUST** be worn anytime personnel exit the TFA in a contaminated environment. Prior to reentry into the TFA they must be decontaminated IAW decon procedures. If under active attack and failures of the system occur, no one should exit the system and all personnel, including patients should don MOPP gear. Patients unable to don MOPP gear should be shielded with patient wraps. When in doubt, don MOPP gear.

(3) Seal up all known air leakage points. This should include the airlocks.

(4) Check the CB liners for unknown leakage points. This could include rips or tears in the liner and/or openings between zipped areas. Check to ensure all two-track flanges are sealed, listen for any air leakage (whistling). Take corrective action to repair leakage points and reinforce repaired areas, if necessary.

(5) Ensure tape or patches on all slider openings are sealed. Reinforce as necessary.

(6) Ensure all electrical and environmental control ducts not in use are tied off.

(7) Ensure all electrical and environmental control ducts in use are tied securely around electrical cables and environmental control unit ducts.

(8) Ensure all motor blowers and FFA 580 400-cfm fan filter assemblies are functioning.

If the alarm sounds due to high pressure, open vents in the airlocks to regulate the pressure to acceptable levels. If necessary, ECU ducts may be opened slightly to bleed off excess pressure.

3-5 EQUIPMENT FAILURE

WARNING

Appropriate MOPP gear MUST be worn anytime personnel exit the TFA in a contaminated environment. Prior to reentry into the TFA they must be decontaminated IAW decon procedures. If under active attack and failures of the system occur, no one should exit the system and all personnel, including patients should don MOPP gear. Patients unable to don MOPP gear should be shielded with patient wraps. When in doubt, don MOPP gear.

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3-5.1 Loss of Power

CAUTION

Timing is critical to prevent loss of pressure within the shelter.

1. When commercial or primary power is lost the back-up generators must be turned on immediately.

2. If under an active CB attack or a residual exposure condition exists, it is imperative to monitor the shelter pressure during a power failure. If pressures within the TFA drop to 0.2 iwg all personnel must don MOPP gear until system has been purged.
3. Appropriate personnel will don MOPP gear and turn on the generators. A minimum of personnel should exit the system to prevent loss of pressure.

4. All FDECUs, motor blowers, and FFA 580 600 cfm/400 cfm blowers will be checked to ensure proper functioning.

5. Personnel will be decontaminated if appropriate prior to reentry into the TFA.

3-5.2 Failure of NBC Hardened Field Deployable Environmental Control Unit

1. During an active CB environment the FDECU will not be replaced or repaired.

2. Using spare CB liner material and chemically protective tape immediately seal off the supply air outlet and return duct in the shelter if no air is felt coming through the system.

3. Loss of heating or cooling into the shelter will be noted, however impact will be minimized by overflow from other areas of the CP EMEDS.

4. Loss of motorblowers attached to system will have an effect on the pressure. Constant monitoring of all gauges must be done. If appropriate pressure cannot be maintained, egress personnel and patients to other areas of shelter and seal off affected shelter.

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4. Loss of motorblowers attached to system will have an effect on the pressure. Constant monitoring of all gauges must be done. If appropriate pressure cannot be maintained, egress personnel and patients to other areas of shelter and seal off affected shelter.

NOTE

The CP EMEDS system was designed to provide 20 cfm fresh air per person (hospital standard). Loss of motorblowers will decrease the amount of fresh air available per person. Loss of one motor blower equates to 10 people; two would be 20 people. In an active chemical environment medical providers must be aware that supplemental oxygen for patients may be required.

5. When appropriate to work in the outside environment replace unserviceable FDECU with spare. For all other maintenance, refer to applicable documents.

   (1) Turn power switch off at unit and remove the remote control box and cable from the shelter.

   (2) Disconnect power connection to the unit (60-amp cable) from the power source (i.e. PDP) and stow cables.

   (3) Disconnect the supply and return ducts from the FDECU leaving the connection to the shelter intact.

   (4) Disconnect power cables for the two motor blowers from the power receptacles on the side of the FDECU.

   (5) Remove the failed FDECU using a forklift.

   (6) Set the spare FDECU at the same approximate location.

   (7) Install the NBC adapter ring with ducts attached by aligning ring to the return end of the unit. Rotate ring in place and install the locking pin. Connect the supply duct to the unit duct flange and secure the clamp.

   (8) Connect the FDECU 60-amp power cable to the power source (PDP) and route the remote control box with cable into the shelter.

   (9) Turn the system on using the remote control or the switch at the unit and set the desired temperature. Turn on motor blowers.

3-5.3 Shelter Damage and Isolation

The following procedures should be followed in the event one or more sections of the CP EMEDS must be evacuated and isolated from the remainder of the system.

NOTE

The CP EMEDS system was designed to provide 20 cfm fresh air per person (hospital standard). Loss of motorblowers will decrease the amount of fresh air available per person. Loss of one motor blower equates to 10 people; two would be 20 people. In an active chemical environment medical providers must be aware that supplemental oxygen for patients may be required.

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3-5.3 Shelter Damage and Isolation

The following procedures should be followed in the event one or more sections of the CP EMEDS must be evacuated and isolated from the remainder of the system.

1. All personnel/patients should don appropriate MOPP gear, evacuate the shelter to the environment and process through the decon area. Incapacitated patients should be shielded in appropriate patient wraps prior to evacuation.

2. All sides of the 8' extension and one side of the vestibule CB liner are equipped with a double flange. While in MOPP gear and during the evacuation process, personnel should zip in a spare CB liner membrane into the opening. This membrane is zipped to the exposed inner two-track flange using the techniques described in section 2-2.3.

3. If possible, once all clear is given, liners may be repaired by taping (using CB tape) extra liner material over holes and tears. Allow approximately two inches of repair material on all sides of hole or tear. A complete purge of the shelter for *** hours must be done and air samples taken using the M-256A1 Air Sample Kit prior to removal of MOPP gear.

3-5.4 Contamination of NBC Filters

Follow procedures in FM 3-4, NBC Protection for filter life spans in normal operation and if contaminated. If in doubt, change out filters immediately after attack.

CHAPTER 4

MAINTENANCE

4-1 MAINTENANCE INSPECTIONS AND PROCEDURES

Refer to the following technical manuals for Preventive Maintenance Inspections and Procedures. Table 2 is a recommended minimum daily checklist. The hospital commander, as desired, may amend it.

4-1.1 CB Liners

Follow procedures outlined in TM 3-4240-338-12&P for liners. The vestibule, 8' extension and 32' CB liners are unique to the AKMSS. Although they are not specifically referenced in TM 3-4240-338-12&P, maintenance inspections and procedures are the same as for the other liners addressed in the manual.

4-1.2 M28 Collective Protection Equipment

This includes all equipment outlined in section 1-6.3 of this manual. Reference M28 Collective Protection Equipment Operator's Manual, Army TM 3-4240-338-12&P for maintenance and inspection procedures.

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1. All personnel/patients should don appropriate MOPP gear, evacuate the shelter to the environment and process through the decon area. Incapacitated patients should be shielded in appropriate patient wraps prior to evacuation.

2. All sides of the 8' extension and one side of the vestibule CB liner are equipped with a double flange. While in MOPP gear and during the evacuation process, personnel should zip in a spare CB liner membrane into the opening. This membrane is zipped to the exposed inner two-track flange using the techniques described in section 2-2.3.

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4-1.2 M28 Collective Protection Equipment

This includes all equipment outlined in section 1-6.3 of this manual. Reference M28 Collective Protection Equipment Operator's Manual, Army TM 3-4240-338-12&P for maintenance and inspection procedures.

4-1.3 Bump-Through-Door Airlock and Filter Blower Units

Reference Appendix B of this manual.

4-1.4 Field Deployable Environmental Control Unit (FDECU)

Reference Army TM 9-4120-411-14 for complete guide on maintenance and inspection procedures.

4-1.5 NBC Filters and Hermetically Sealed Filter Canister

Reference Army Field Manual 3-4.

4-1.6 Low Pressure Alarm

Reference commercial manual enclosed with low pressure alarm.

4-1.7 Alaska Medical Shelter System (AKMSS)

Reference commercial manual enclosed with system.

4-1.8 TEMPER Equipment

Reference Army TM 10-8340-224-13 for complete maintenance inspection and procedures. This will also include light boxes and Bruce lights.

4-1.9 Recommended CP EMEDS Daily Operational Checklist

Table 2 is a recommended minimum daily operational checklist. It may be amended by the hospital commander to suit the mission.

4-1.3 Bump-Through-Door Airlock and Filter Blower Units

Reference Appendix B of this manual.

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Table 2 is a recommended minimum daily operational checklist. It may be amended by the hospital commander to suit the mission.

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Table 2. CP EMEDS Daily Checklist

#	ITEM Items below are to be accomplished and signed off at the beginning of each shift, a minimum of every 12 hours. Discrepancies will be annotated and brought to the attention of appropriate personnel.	S	U	Initials
1.	Check magnehelic gauges at all airlocks and at all low pressure alarms. Ensure pressure readings of 0.5 – 0.75 iwg in TFA and 0.3 iwg in airlocks. Refer to section 3-3 for regulation of pressure.			
2.	Check all CB liner and membrane interfaces to ensure membranes are zipped together, delamination has not occurred, tape and liner patches have not come loose and seals are maintained. Repair or reinforce as necessary.			
3.	Check each 8' extension area to ensure an extra CB membrane(s) are available for isolating the contaminated area.			
4.	Ensure recirculation filter assemblies are plugged in and operational.			
5.	Ensure both hoses in the HSFCs are connected and motor blowers are turned on. Ensure FFA580 blower units are operational.			
6.	Check hour meter in motor blowers and annotate hours. **NOTE:** Due to life span of 500 hours, recommend changing out motor blowers at 450 hours or sooner if CB attack is imminent and identified by CP EMEDS commander. **_____ hours**			
7.	Check stakes and guy wires for security and tightness.			
8.	Appropriate personnel will accomplish daily checks of FDECU's. Notify them if system unoperational.			

4-2 TROUBLE SHOOTING PROCEDURES

Reference appropriate manuals listed in Table 1 for trouble shooting of equipment. Refer to Appendix B for trouble shooting of the BTD Airlock. Refer to Table 3 for common symptoms and inspections.

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4.	Ensure recirculation filter assemblies are plugged in and operational.			
5.	Ensure both hoses in the HSFCs are connected and motor blowers are turned on. Ensure FFA580 blower units are operational.			
6.	Check hour meter in motor blowers and annotate hours. **NOTE:** Due to life span of 500 hours, recommend changing out motor blowers at 450 hours or sooner if CB attack is imminent and identified by CP EMEDS commander. **_____ hours**			
7.	Check stakes and guy wires for security and tightness.			
8.	Appropriate personnel will accomplish daily checks of FDECU's. Notify them if system unoperational.			

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Reference appropriate manuals listed in Table 1 for trouble shooting of equipment. Refer to Appendix B for trouble shooting of the BTD Airlock. Refer to Table 3 for common symptoms and inspections.

Table 3. Trouble Shooting Procedures

	SYMPTOM	INSPECTION
1.	Shelter pressure below 0.4 iwg.	Check FDECU's, motor blowers and FFA 580 400-cfm blower for proper functioning. Change out motor blowers not functioning.
2.	Shelter pressure above 0.80 iwg	Open or adjust hook and pile vent covers of PE and BTD airlocks until proper pressure is achieved. NOTE: Wait approximately 5
3.	Airlocks do not maintain 0.2-	Ensure pressure gauges have been calibrated correctly prior to pressurization.
4.	Shelter too hot or cold.	Ensure FDECUs functioning properly.
5.	Shelter raising from ground while	Ensure stakes are properly installed.
6.	CB liners two-tracks too difficult to close.	Check slider for sharp edges. Change out if needed.

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5.	Shelter raising from ground while	Ensure stakes are properly installed.
6.	CB liners two-tracks too difficult to close.	Check slider for sharp edges. Change out if needed.

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7.	Run-out at edge of two-track flange.	Manipulate flange while zipping. Gently ease excess flange back along track. This may cause some puckering, which is acceptable, however, care must be given to inspect the flange for bubbles or gaps which are not acceptable. If found, re-zip. Small gap or excess is allowable at opening of flange. This will be covered with tape or patches. Excess at slider opening should not exceed 2 inches.

4-3 SYSTEM SHUTDOWN

1. Non-threat operations IAW Section 2.
2. After contamination by direction of installation commander.

4-4 SPECIAL TOOLS AND EQUIPMENT

1. Maintenance and repair of FDECUs requires tools and equipment that are designed for use on air conditioning and heating equipment.
2. Special tools and equipment for M28 Collective Protection Equipment to include the CB liners are identified in Army TM 3-4240-338-12&P.
3. Tools needed for the BTD airlock are in Appendix B.

CHAPTER 5

CP EMEDS +25 COMPONENT PARTS LIST

5-1 GENERAL INFORMATION

This chapter lists components of the CP EMEDS +25 to help you inventory items for safe and efficient operation. It DOES NOT include the AKMSS parts. The information in this chapter is also intended for use in requisitioning, issuing and identifying the CP EMEDS +25 components.

5-2 CP EMEDS +25 MAJOR COMPONENTS

Table 4 shows all the major components that comprise CP EMEDS +25 and quantities required. Item description, National Stock Numbers (NSN) and/or part numbers are provided to help you identify, inventory and/or request the items required.

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7.	Run-out at edge of two-track flange.	Manipulate flange while zipping. Gently ease excess flange back along track. This may cause some puckering, which is acceptable, however, care must be given to inspect the flange for bubbles or gaps which are not acceptable. If found, re-zip. Small gap or excess is allowable at opening of flange. This will be covered with tape or patches. Excess at slider opening should not exceed 2 inches.

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Table 4. CP EMEDS +25 Component List

ITEM	QTY	NSN	PART NUMBER
32’ CB Liner	10		
8’ Extension, CB Liner	5		
Vestibule, CB Liner	4		
Bump-Through-Door Airlock Assembly with FFA 580 600 cfm blower assembly (refer to Appendix B for complete parts breakdown for BTD airlock).	2		
Internal Partition for CB Liner	3		
Recirculation Filter Assembly	4	4240-01-348-5257	
Recirculation Filter Element	4	4240-01-332-2068	
Low Pressure Alarm	5		
Field Deployable Environmental Control Units (FDECU)	10	4120-01-449-0459	
FDECU NBC Hardening Kits	10	4120-01-434-7665	
Support Kit, Tent Extendible (Motor blowers)	20	4240-01-406-9350	
Maintenance Kit, Motor Blowers	9	5180-01-331-2921	
Hermetically Sealed Filter Canister	20	4240-01-178-9936	
FFA 580 400 cfm Fan Filter Assembly (1 replaces 2 motor blowers & 2 HSFCs)	10		
Filter Set, Gas Particulate, M56A (Without 400 cfm fan filter assembly)	6	4240-01-369-6533	
Filter Set, Gas Particulate, M56A (with 400 cfm fan filter assembly)	26		
Protective Entrance (PE) Airlock	2	4240-01-331-2938	
PE Airlock CB Adapter	2	4240-01-460-9055	
PE Airlock Light Adapter	2		5-4-8644
AKMSS Modified Endwall	2		
AKMSS Modified 8’ Extension	1		
Vestibule, TEMPER (for PE Airlock)	2	8340-01-198-7621	
Vestibule Frame, TEMPER	6	8340-01-186-3010	
Tent Pin, Steel, 18in	50	8340-00-985-7461	
Insulated Floor, TEMPER, Vestibule	4	8340-01-186-3028	
Insulated Floor, TEMPER, 8x20	45	8340-01-186-3025	

5-3 EXPENDABLE/DURABLE SUPPLIES AND MATERIALS

Table 5 of this section lists additional items, expendable/durable supplies, and materials you will need to operate and maintain the CP EMEDS +25 system. Appendix B lists items need for the BTD airlock. Quantity encompasses a full CP EMEDS +25 and does not suggest replacement numbers. Item description, National Stock Numbers (NSN) and/or part numbers are provided to help you identify and request the items required.

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AKMSS Modified Endwall	2		
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Vestibule, TEMPER (for PE Airlock)	2	8340-01-198-7621	
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Table 5. Repair Kit Components

ITEM	QTY	NSN	PART NUMBER
Knife, Craftsman	20	5110-01-428-5231	
Tape, Pressure Sensitive, 60yds, 2”	10	7510-00-266-5016	
Tape, Chemically Protective	10		
Adhesive Patches, Chemically Protective	100		

SAFETY SUMMARY

Operating personnel must observe safety regulations at all times.

WARNING AND CAUTION STATEMENTS

WARNING and CAUTION statements have been strategically placed throughout this text immediately preceding operating/maintenance procedures and practices/conditions considered essential to the protection of personnel (WARNING) or equipment and property (CAUTION). A WARNING and/or CAUTION will apply each time the related step is repeated. Prior to starting any task, the WARNINGS and/or CAUTIONS included in the text will be reviewed and understood.

WARNING

KEEP AWAY FROM LIVE CIRCUITS

Operating personnel must think safety at all times. Do not replace components or make adjustments inside equipment with the electrical supply turned on. Under certain conditions, danger may exist even when power control is in the off position due to charges retained by capacitors. To avoid injuries, always remove power, discharge, and ground a circuit before touching it. Adhere to lockout/tagout procedures.

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WARNING

HIGH VOLTAGE/HIGH CURRENT

High voltage and current is used in the operation of this equipment. DEATH ON CONTACT may result if personnel fail to observe precautions.

Learn the areas containing high voltage and/or current in each piece of equipment.

Before working inside the equipment, turn off power, and ground points of high potential before touching them.

WARNING

ELECTRIC SHOCK

Remove all metallic and other conductive items before attempting to work on equipment. Remove watches, rings, identification tags, bracelets, etc. What could be only a minor shock can become a serious burn if this rule is ignored.

WARNING

TOXIC HAZARD

Decontaminate all contaminated equipment and personnel before entering the Collectively Protected Expeditionary Medical Support (CP EMEDS).

Ideally, these systems will not be erected in a contaminated environment. However, if required, personnel may require protective mask and clothing until the shelters are deployed and operational. The shelter manager will determine the level of protection.

When the CP EMEDS is deployed in a toxic environment, it may take up to *** *hours from the time the blowers are turned on to purge liner of toxic vapors. Personnel who enter the shelter during this purge interval shall wear clean, uncontaminated protective clothing. Failure to do so could result in prolonged purge time and recontamination of personnel.*

Do not locate a blower near an area where exhaust gases are generated because the gas particulate filters will not remove carbon monoxide.

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When the CP EMEDS is deployed in a toxic environment, it may take up to *** *hours from the time the blowers are turned on to purge liner of toxic vapors. Personnel who enter the shelter during this purge interval shall wear clean, uncontaminated protective clothing. Failure to do so could result in prolonged purge time and recontamination of personnel.*

Do not locate a blower near an area where exhaust gases are generated because the gas particulate filters will not remove carbon monoxide.

WARNING

INJURY HAZARD

Work gloves must be used when erecting these systems.

Numerous components of CP EMEDS are heavy and require caution to prevent injury. When lifting and/or carrying components weighing more than 75 pounds, use a minimum of 2 personnel. Improper lifting or erecting of the CP EMEDS components may cause back strain to personnel. To avoid back strain follow proper lifting procedures.

Hearing protection must be worn when working within 4 feet of an operating diesel generator. Injury to personnel or hearing loss may result if warning is not observed.

Sharp edges on the frames and feet of the Bump-Through-Door (BTD) Airlock assemblies can cause injury to personnel and damage to the Chemical/Biological liner. Exercise caution when erecting and disassembling these items.

Door locks and hinges can present a pinch hazard. Exercise caution when locking bump-through-doors, as fingers can be pinched between door lock and door.

Sharp edges on filter canister can cause injury to personnel. Use care when connecting or disconnecting air ducts to filter.

Keep hands clear of leg hinges when erecting or striking protective entrance airlocks.

WARNING

FIRE HAZARD

Keep flames and sparks clear of the system. CP EMEDS provides chemical protection with materials, which are flammable but not readily ignitable. If fire breaks out in the shelter and cannot be controlled/extinguished it may be necessary to cut the liner for emergency exit.

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WARNING

HEALTH/ENVIRONMENTAL HAZARD

The motor blowers connected to each hardened FDECU provide a total of 400 cubic feet per minute (cfm) of fresh make-up air. Therefore, the CP EMEDS +25, with 10 each FDECUs, provides a total of 4000 cfm of fresh air. With the requirement of 20 cfm of fresh air per person, the CP EMEDS +25 can accommodate a maximum occupancy of 200 personnel.

NBC filters use ASC Whetlerite Carbon, which contains Chromium VI. Chromium VI is a known carcinogen if inhaled or swallowed. Damaged, used or unusable filters are classified as hazardous waste:

DO NOT throw away damaged, used or unusable filters as ordinary trash.

DO turn in damaged, used or unusable filters to your hazardous waste management office or Defense Reutilization and Marketing Office (DRMO).

Filters are completely safe to handle and use if they are not damaged in such a way that carbon leaks from them. In the unlikely event that carbon should leak, use protection such as a dust respirator to cover nose and mouth and put carbon in container such as self-sealing plastic bag; turn into hazardous waste management office or DRMO.

Disposal of hazardous waste is restricted by the Resource Conservation and Recovery Act as amended (42 U.S.C.A. sec 6901 et seq). Violation of these laws is subject to severe criminal penalties.

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Site Lay Out

IAW AFM 161-10 or NAVMED 50-10 No magic numbers, only estimates. Each situation will have site unique challenges.

1. Sleeping Area

- 50 feet down wind from latrines.
- 30 yards from garbage area.
- Preferred location away from the flight line.

2. Latrines:

- 100 yd. from food facilities
- Level ground, never uphill from campsite or water supplies; Downwind.
- 100 ft from the nearest natural water source.
- 50 ft from sleeping areas.
- Seats 4% of males and 6% of females.
- One urine soakage pit pipe per 20 men

3. Garbage/Soakage Pits

- 30 yd. from food service facility
- Burial at least 100 ft from the food service facility.
- Garbage or rubbish must be buried or burned/ashes should be buried.
- Locate 100 ft from any natural water source or ground water source.
- 4x4x4 soakage pit will service a field mess serving 200 people or less for 2 weeks or less.
- 4x4x4 garbage pit will service 100 people for one day.

4. Grease Traps

- Constructed between the field mess and each soakage pit, trench, or evaporation bed.

5. Hand washing

- Adequate hand washing facilities available?
- Locate near latrine and food facilities
- One per 25 personnel available at latrine?
- Provide a soakage pit for the hand washing facility

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6. Showers

- Adequate shower facilities available?
- One shower head per 25 personnel
- Soakage pit should be provided for shower facility
- Wash showers down daily; use 50 ppm chorine solution weekly.

7. DECON Area

- Contamination Control(CC) 250 ft downwind, down hill, down stream from MTF
- Establish a vapor hazard line half way between MTF and CC facility.
- Contaminated Dumpsite 75 ft from contamination control point.
- Contaminated dumpsite will be near the CC facility (when practical) for easy access.
- If the CC is in the same building as the MTF then the dump will be 250 feet downwind from the CC.

8. Hospital

- Accessible to patients?
- Not near a tactical target?
- 250 feet upwind from decon

9. Mortuary Affairs

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Law of Armed Conflict (LOAC)

SECTION I - Historical Background

Law of Armed Conflict or LOAC is comprised of basic rules defining how we fight a war. LOAC differs from Rules of Engagement in that ROE are specific instructions telling us how to operate during a specific scenario. We have Southern watch ROE and we had ROE in Desert Storm. LOAC is a set of generalized rules which would apply to *any* armed conflict.

Although it may seem strange that we have rules telling us how to fight wars, LOAC principles have developed from a variety of places.

- Many of the rules have developed over time and come from **customs** - how countries have conducted themselves in battle throughout history. (EXAMPLE: Waiving a white flag means surrender).

- Another place that LOAC rules come from is **international law**. Some common examples are the Geneva Conventions, Hague Conventions, and the recent Chemical Weapons Convention.

- Finally, we have rules that develop from **U.S. law** such as the Uniform Code of Military Justice (UCMJ), and the Code of Conduct.

Now that you know where the law comes from, you may wonder why do we need rules telling us how to fight a war. There are many reasons. Some are political or philosophical. These reasons include minimizing the damage we cause during a war, avoiding unnecessary suffering, protecting human rights, and easing the transition from war back to peace.
Although it may seem odd, it has been shown that if a country does its best to inflict as little damage to property and injury to people as possible, the losing country is more likely to accept the terms of peace.
Equally important is that following LOAC helps us in our military operations. For example, it is a violation of LOAC to bomb a church. Most people would agree that a church used only for worship purposes is not a military threat. If we waste a bomb blowing up that church, that is one less bomb we have to use against a legitimate military target such as enemy aircraft hangar.
So you can see that by following the rules of LOAC, we save our people and weapons for the most important targets. This helps us maximize our mission effectiveness in a war.

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SECTION II: Basic Principles

The rules that make up LOAC come from 3 basic principles.

First is MILITARY NECESSITY. We only take actions necessary to achieve a legitimate military objective. Think back to that church. There was no military objective to be gained by targeting the church so we don't.

Second, is HUMANITY. We avoid inflicting unnecessary suffering. That is we don't hurt people or destroy their property just for the sake of wreaking havoc.

There are, of course, many times when a target may provide a military advantage but may also cause some unnecessary suffering. This is where we use the third principle, PROPORTIONALITY. That is to say, we use no greater force than is needed to obtain the desired military objective.

You can think of proportionality as a balancing test. For instance, let's say that Saddam Hussein parks one of his jets in downtown Baghdad near a civilian apartment complex. Clearly there is a military need to destroy the aircraft. However, we could potentially kill a lot of innocent civilians. Proportionality may tell us not to bomb the plane or to use precision guided munitions. You can see that our commanders must place a lot of careful thought into creating a target list.

SECTION III - Targeting

Now that we know the basic LOAC principles, we can apply them to specific examples like targets.

Basically,targets are people, places, and things.

In a war you will come across many different kinds of people. Some people will be COMBATANTS. Combatants are all members of the military except for medical personnel, chaplains, POWs, wounded and sick, shipwrecked, and parachutists escaping disabled aircraft.

A combatant is a legal target.

You may also run into some NONCOMBATANTS. These people include medical personnel, chaplains, POWs, wounded and sick, shipwrecked, parachutists escaping disabled aircraft, and civilians. NONCOMBATANTS are NOT legal targets. A noncombatant poses no military threat to us. Therefore, there is no military necessity (principle I) in targeting them.

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How do you know if someone is a military medical personnel or chaplain? We all wear the same uniform right? Medical personnel and chaplains may wear the same uniform, but they will also wear an arm band with a red cross. Only medical personnel and chaplains are allowed to wear a red cross.

What happens if a NONCOMBATANT threatens your life? In that case, they have given up their protected status and become UNLAWFUL COMBATANTS. UNLAWFUL COMBATANTS are legal targets.

Remember, you always have a right to self defense. This includes a right to defend yourself, other U.S. troops, and U.S. property.

We have talked about people we may encounter in a war. Now let's talk about places.

There are many legal places that we can target. Basically, any base, forward located military base or area housing troops is a legal target. Places like command post, military dorms, the chow hall, and military buildings are legal targets.

Places such as hospitals or religious buildings (church, mosque, synagogue) are also protected--whether military or civilian buildings. Of course, the buildings must be marked with a recognizable symbol (Red Cross, etc.) and they cannot be used for other than religious purposes or treating the sick and injured people.

So, if we store extra M-16s in the chapel or in a shack adjacent to the hospital, our chapel and hospital may lose their protection. In other words, we can not protect lawful targets by sheltering them in protected places. Think back to the earlier example of Saddam Hussein parking his jets near a civilian apartment complex.

Cultural landmarks are also protected places. Some examples are the Taj Majal and the Great Pyramids.

Finally, Prisoner of War Camps are protected places. They are not legal targets. POW camps like hospitals and churches must be marked. POW camps are marked with a PW or PG.

The last set of targets we may see in a war are things. Any military vehicle, ship, tank, or aircraft is a legal target. An exception to this rule are vehicles and aircraft being used for medical purposes like an ambulance or C-9.

Any military weapon is a legal target. For example, our Patriot missiles, our Mavericks, AIM-9s, and GBU's.

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A power plant is a legal target because it provides electricity to run military operations. Of course, we always have to remember proportionality and see what taking out a power plant or a dam will do to civilians and other noncombatants.

Civilian factories are legal targets if they are being used to support the war effort. So, uniform factories or weapons production plants, or chemical weapons plants are all legal targets even if they are civilian factories.

Civilian property that does not support the war effort, for example, a local grocery store or jewelry store, is not a legal target. Also, you may NOT steal from civilians.

So as you can see, we can legally target a wide range of people, places, and things during a war.

SECTION IV- Weapons

All weapons used by the Air Force are reviewed to make sure they are legal. So, if the Air Force issues you a weapon, you can use it. Be sure to use the weapon in the form it is issued to you. Altering the weapon (e.g., making bullets hollow point) can make a legal weapon illegal.

Weapons are evaluated to see if they cause unnecessary suffering. If they do they are illegal.

Some people are surprised at which weapons are legal. For example napalm, flame throwers, white phosphorous, and nuclear weapons are all legal weapons.

Poisons, asphyxiating (choking agents), and other gases are illegal. Biological weapons are also illegal.

Projectiles must be jacketed to be legal. They cannot be expanding or exploding, because these cause unnecessary suffering. Therefore glass projectile bullets are illegal. Hollow point bullets are illegal for most people to use. There are exceptions for some special forces and security police. If you are authorized to use hollow point bullets, the Air Force will issue them to you. This is not a decision you make on your own.

A unique problem in weapons centers around riot control agents. The most commonly used riot control agent is tear gas. Under the recently ratified Chemical Weapons Convention, riot control agents have been outlawed as a means of warfare. However, they can still be used to control noncombatants. The only person who can authorize the use of riot control agents is the National Command Authority. So although we can still use riot control agents, make sure you know you are authorized to use them and when.

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SECTION V - Prisoners of War

Prisoners of War (POWs) receive special protections under LOAC. Combatants are entitled to POW status. So are civilians who accompany the armed forces and crew members of both the merchant marine and civil aircraft of parties to the conflict. Since it is not always clear who is a combatant and who is not, U.S. policy is to treat all people as POWs until their status can be determined.

POWs are not returned until the end of the conflict.

You may wonder if medical personnel and chaplains get POW status, since they are not combatants. The answer is no. Medical personnel and chaplains are considered retained personnel. The enemy is only supposed to keep them long enough to treat our troops and they are supposed to be returned as soon as possible. Retained personnel are NOT to be held until the end of the conflict.

POWs are entitled to special protections.

We are supposed to keep POWs separated from the battlefield if at all possible. Remember POW camps are supposed to be marked and are not legal targets. We can not use POWs to shield our own people. We can use handcuffs and blindfolds to secure POWs temporarily only if it is absolutely necessary to restrict their vision or movement. For example, we may use handcuffs to restrict a POW's movement when transporting him or her. However, once the POW reaches a holding area, the handcuffs must be removed.

POWs are not supposed to be used for propaganda purposes. They are entitled to humane treatment and respect. We are required to protect POWs from violence, intimidation, insults, and public curiosity. So, when Sadaam Hussein paraded allied POWs on TV forcing them to read prepared statements, this was a violation of LOAC.

POWs are entitled to keep their personal property such as wedding rings and family photographs. Any information they have pertaining to the military or war may be confiscated. Any weapons may be confiscated. Anything that can be used as a weapon, such as shoe laces or a helmet, maybe confiscated.

POWs are entitled to food, clothing and shelter, and oddly enough, tobacco. They are entitled to medical care equal to the care we give friendly forces. So if there is an American soldier with a broken arm and an Iraqi soldier with a sucking chest wound, the Iraqi gets treated first. Also, we must provide our POWs with protective gear such as a chem mask. During interrogations, POWs are only required to give their name, rank, DOB, and serial number. We cannot torture or beat POWs to get additional information.

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We can require POWs to work based on rank. However, the work cannot be dangerous or aid us in our war effort. Realistically, do you want an enemy prisoner building your lookout tower? There is a high risk of poor workmanship and sabotage.

POWs are required to follow camp disciplinary rules. They may receive certain punishment for violating the rules. POWs may even be court-martialed, but, just like you, they are entitled to a fair trial and due process rights. This includes an interpreter so they can understand the charges against them and the proceedings.

Most of you are probably thinking that most of our enemies do not abide by any of the rules we have talked about. In many instances, this is true. However, this does not relieve us of our obligation to follow the rules. Although it isn't fair for the other side not to follow the rules, we have decided to take the moral high ground when it comes to LOAC.

SECTION VI - Reporting Requirements

You have an affirmative duty to report any suspected LOAC violation. This includes violations by enemy, U.S., or any of our allied forces.

You should report any suspected LOAC violations to your commander, the IG, the chaplain, or the legal office.

It does not matter if your suspicions turn out to be wrong. Always err on the side of caution and report things up the chain of command. In this case, it is truly better to be safe rather than sorry.

SECTION VII- Consequences

We all have an individual duty to know the law of armed conflict and to follow the rules. This includes reporting suspected violations. If we do not report them, we can be subject to trial by an international court or we can be prosecuted by the military.

You must also follow lawful orders. However, an order to commit a criminal act, such as a violation of the law of armed conflict, is illegal...you must not follow it. You can presume an order to perform a military duty is legal, but following an order that an ordinary person would know to be illegal, isn't excusable. For instance, an order to shoot all unarmed civilians or to kill a POW would be illegal. Obeying it would be a violation.

What should you do if you think you've been given an illegal order? First, ask for clarification. Maybe the order was unclear, or you didn't understand it. If you still think the order is illegal, try to get it withdrawn. If that doesn't work, you must disobey it. If others obey the order, you have the duty to report that violation of the law of armed conflict.

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We can require POWs to work based on rank. However, the work cannot be dangerous or aid us in our war effort. Realistically, do you want an enemy prisoner building your lookout tower? There is a high risk of poor workmanship and sabotage.

POWs are required to follow camp disciplinary rules. They may receive certain punishment for violating the rules. POWs may even be court-martialed, but, just like you, they are entitled to a fair trial and due process rights. This includes an interpreter so they can understand the charges against them and the proceedings.

Most of you are probably thinking that most of our enemies do not abide by any of the rules we have talked about. In many instances, this is true. However, this does not relieve us of our obligation to follow the rules. Although it isn't fair for the other side not to follow the rules, we have decided to take the moral high ground when it comes to LOAC.

SECTION VI - Reporting Requirements

You have an affirmative duty to report any suspected LOAC violation. This includes violations by enemy, U.S., or any of our allied forces.

You should report any suspected LOAC violations to your commander, the IG, the chaplain, or the legal office.

It does not matter if your suspicions turn out to be wrong. Always err on the side of caution and report things up the chain of command. In this case, it is truly better to be safe rather than sorry.

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-12	-11	-10	-9	-8	-7	-6	-5	-4	-1	GMT	+1	+2	+3	+4	+5	+5.5	+7	+8	+9	+9.5	+10	+12
Kwajalein	Midway Pago Pago	Hawaii	Elmendorf	Pacific Time	Mountain Time	Central Time	Eastern Time	Bermuda Puerto Rico	Azores	England Ireland	Germany Italy	Turkey Greece	Riyadh	Tehran	Pakistan	New Deli	Thailand	Phillipines	Okinawa Japan	Alice Springs (AUS)	Guam	Wake New Zealand
0600	0700	0800	0900	1000	1100	1200	1300	1400	1700	1800	1900	2000	2100	2200	2300	2330	0100	0200	0300	0330	0400	0600
0700	0800	0900	1000	1100	1200	1300	1400	1500	1800	1900	2000	2100	2200	2300	2400	0030	0200	0300	0400	0430	0500	0700
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1100	1200	1300	1400	1500	1600	1700	1800	1900	2200	2300	2400	0100	0200	0300	0400	0430	0600	0700	0800	0830	0900	1100
1200	1300	1400	1500	1600	1700	1800	1900	2000	2300	2400	0100	0200	0300	0400	0500	0530	0700	0800	0900	0930	1000	1200
1300	1400	1500	1600	1700	1800	1900	2000	2100	2400	0100	0200	0300	0400	0500	0600	0630	0800	0900	1000	1030	1100	1300
1400	1500	1600	1700	1800	1900	2000	2100	2200	0100	0200	0300	0400	0500	0600	0700	0730	0900	1000	1100	1130	1200	1400
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-12	-11	-10	-9	-8	-7	-6	-5	-4	-1	GMT	+1	+2	+3	+4	+5	+5.5	+7	+8	+9	+9.5	+10	+12
Kwajalein	Midway Pago Pago	Hawaii	Elmendorf	Pacific Time	Mountain Time	Central Time	Eastern Time	Bermuda Puerto Rico	Azores	England Ireland	Germany Italy	Turkey Greece	Riyadh	Tehran	Pakistan	New Deli	Thailand	Phillipines	Okinawa Japan	Alice Springs (AUS)	Guam	Wake New Zealand
0600	0700	0800	0900	1000	1100	1200	1300	1400	1700	1800	1900	2000	2100	2200	2300	2330	0100	0200	0300	0330	0400	0600
0700	0800	0900	1000	1100	1200	1300	1400	1500	1800	1900	2000	2100	2200	2300	2400	0030	0200	0300	0400	0430	0500	0700
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